Devoted to
TEXTILE
CHEMISTRY
BLEACHING
DYEING
PRINTING
FINISHING

AUGUST 11, 1947
VOLUME 36, No. 16

AMERICAN DYESTUFF REPORTER

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Bright and Gay

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ANTI-FUME DE PASTE

Anti-fume DE Paste is an inhibitor of atmospheric gas fading of dyed acetate rayon.

As is well known, a number of the acetate dyes, even those having the highest lightfastness, fade when exposed to atmospheric gas fumes. The use of selected dyes from this group, protected by Anti-fume DE Paste, properly applied, makes possible the production of certain important shades on acetate rayon with better all-round fastness.

Anti-fume DE Paste is substantively absorbed by the material, and its protective effect persists after washing and dry cleaning. When properly used, it provides a valuable new aid for the acetate rayon dyer.

Our technical personnel are cooperating with those interested in the use of this product.

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Du Pont Dyestuffs

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...THROUGH CHEMISTRY

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OFFICIAL PUBLICATION
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CHEMICAL RESEARCH *for* *Fabric Perfection*

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WARCOSOL*

Warcosol fulfills the textile need for instantaneous and even wetting. Three types are available in keeping with Warwick's principle of developing the most efficient and economical answer for every specific problem. Warwick technical advisors, with their wide knowledge of textile chemicals and processes are available for consultation at all times.

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Color is our business

To that business we devote our entire research facilities and production capacities. Working hand in hand with textile craftsmen, our staff is ready to create the exact color . . . meet ideal specifications as to fastness properties that any job requires. A.A.P. technicians may be consulted at any of our branch offices.

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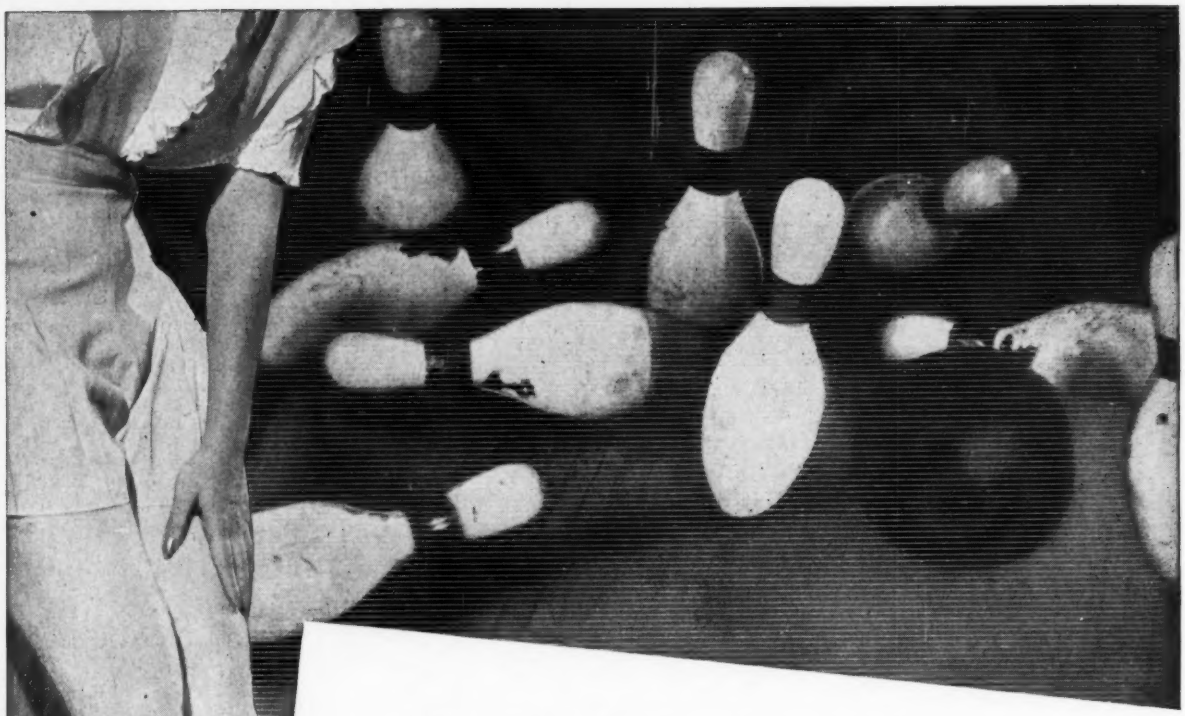

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In textiles as on the alley . . . it's the *finish* that counts. To meet today's competitive conditions your product must look well . . . have a "striking" appearance.

For finishing nylon, silk, rayon, wool, or cotton . . . or any mixture . . . Fancourt can provide the correct formula. If you want to chalk up a new high on your sales chart it will pay you to call on Fancourt.

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For scouring and dyeing of Nylon. Gives clear and level shades. Prepares hose for resin finishing.

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Neolene 210 is easily sulfonated to yield an efficient wetting agent and detergent useful for many applications. The sulfonate may be either drum or spray dried.

The following curves illustrate the wetting efficiency of a 40% active sodium sulfonate of Neolene 210.

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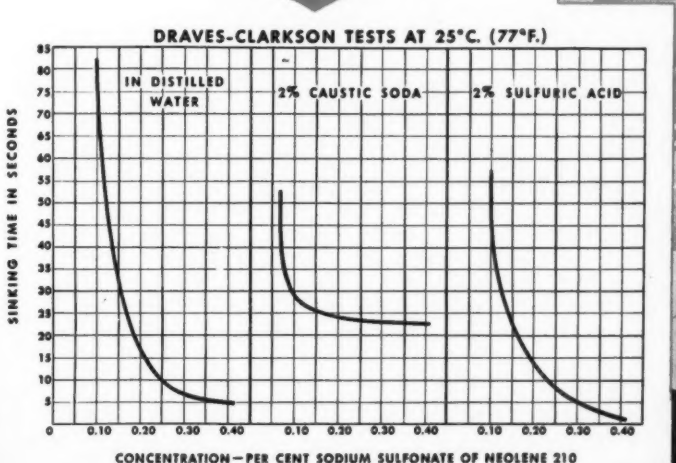
DRAVES-CLARKSON TESTS AT 25°C. (77°F.)
IN DISTILLED WATER
2% CAUSTIC SODA
2% SULFURIC ACID
SINKING TIME IN SECONDS
CONCENTRATION—PER CENT SODIUM SULFONATE OF NEOLENE 210

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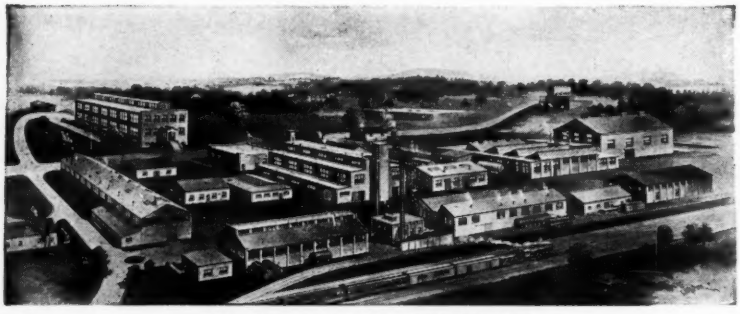

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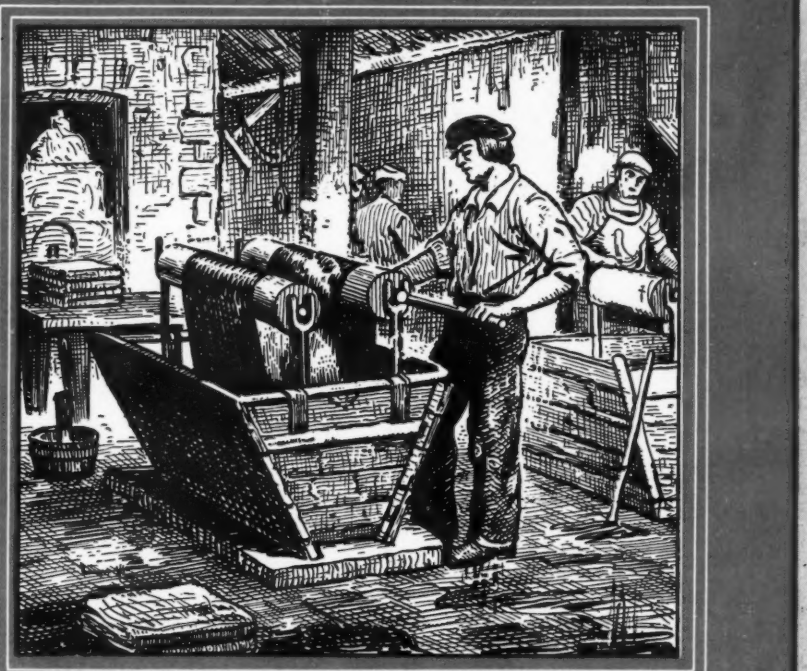

A dye beck in the year 1820 — *Courtesy J. B. Lippincott Co.*

The dyer of 1820 was limited to the use of *natural* dyestuffs.

The first practical, *synthetic* dyestuff appears to have been prepared in 1856. This was followed by an era of significant progress in the textile industry.

In utilizing *modern* dyestuffs, today's dyers are aided by Rapidase. This product of Wallerstein Research assures rapid and consistently effective de-sizing of cottons, rayons and mixed goods over a wide range of temperatures.

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Technical and refined grades — in 100-lb. carboys.

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Chlorinated Benzyl Chlorides	**Ortho Chlor Benzyl Chloride** Assay: 98.0% Containers: Glass carboys	**Para Chlor Benzyl Chloride** Assay: 97.0% Containers: Glass carboys	**2,4-Dichlor Benzyl Chloride** Assay: 97.0% Containers: Glass carboys	**3,4-Dichlor Benzyl Chloride** Assay: 96.0% Containers: Glass carboys
Chlorinated Benzoyl Chlorides	**Ortho Chlor Benzoyl Chloride** Assay: 95.0% Containers: Glass carboys	**Para Chlor Benzoyl Chloride** Assay: 98.0% Containers: Glass carboys	**2,4-Dichlor Benzoyl Chloride** Assay: 98.0% Containers: Glass carboys	**3,4-Dichlor Benzoyl Chloride** Assay: 95.0% Containers: Glass carboys
Chlorinated Benzotrichlorides	**Ortho Chlor Benzotrichloride** Assay: 98.0% Containers: Glass carboys	**Para Chlor Benzotrichloride** Assay: 98.0% Containers: Glass carboys	**2,4-Dichlor Benzotrichloride** Assay: 98.0% Containers: Fiber drums	**3,4-Dichlor Benzotrichloride** Assay: 96.0% Containers: Glass carboys
Chlorinated Toluenes	**Ortho Chlor Toluene** Assay: 99.0% Containers: Glass carboys or iron drums	**Para Chlor Toluene** Assay: 97.0% Containers: Glass carboys or iron drums	**2,4-Dichlor Toluene** Assay: 99.0% Containers: Glass carboys or iron drums	**3,4-Dichlor Toluene** Assay: 97.0% Containers: Glass carboys or iron drums
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You are invited to write for technical literature on these chemicals.

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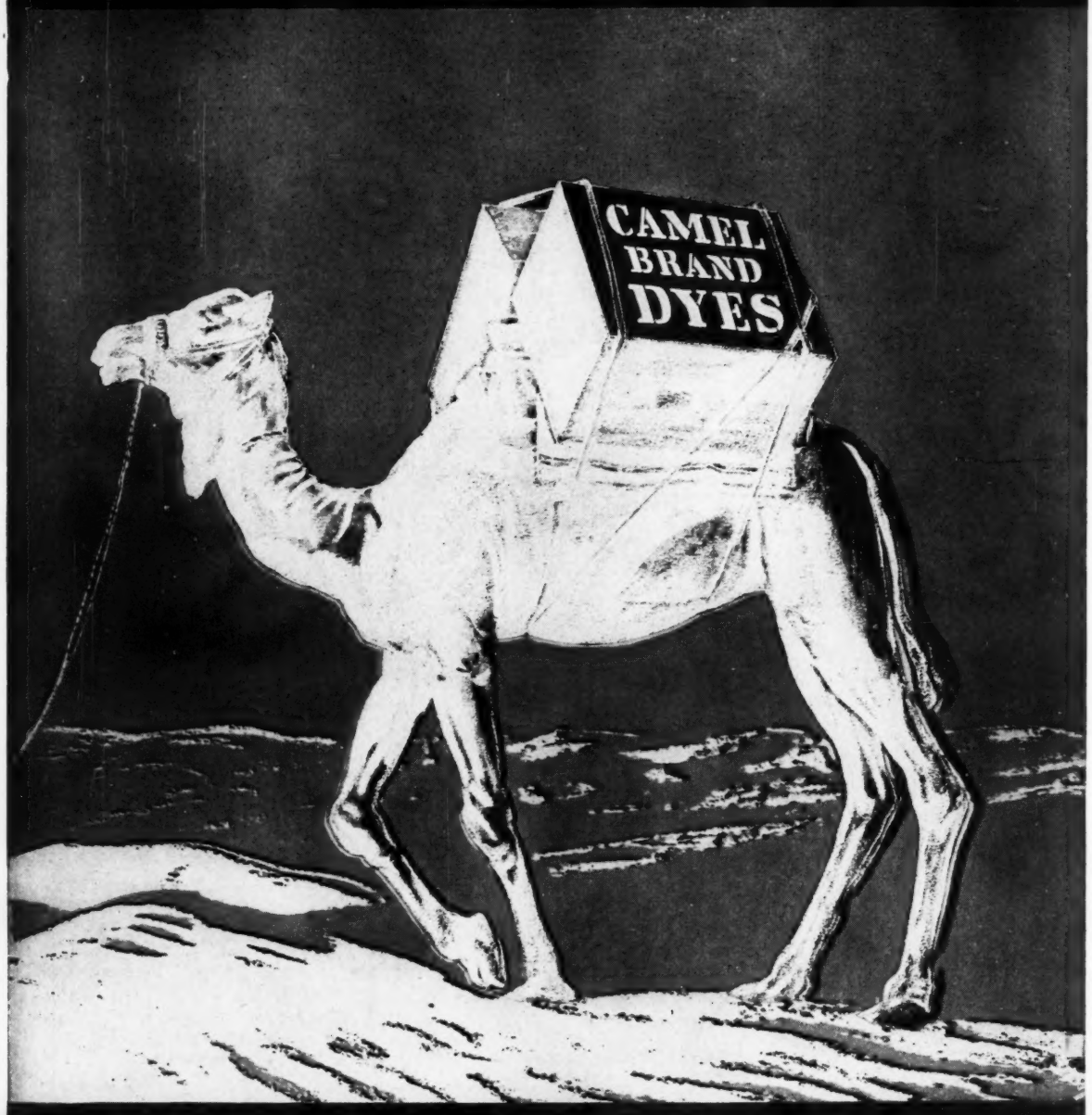

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Water Repellency

REALLY LASTING water repellency on cotton-rayon, cotton-acetate and many all rayon, acetate and nylon constructions is provided by

REPEL-O-TEX
D3 & D4

. . . yet the cost is no greater than that of ordinary fugitive repellent finishes.

Easy to apply in jig, pad or quetsch. No curing . . . no scouring . . . no extra handling operations. Applicable to other fabrics than those enumerated above, with excellent effects of less durability.

May we arrange for a trial run?

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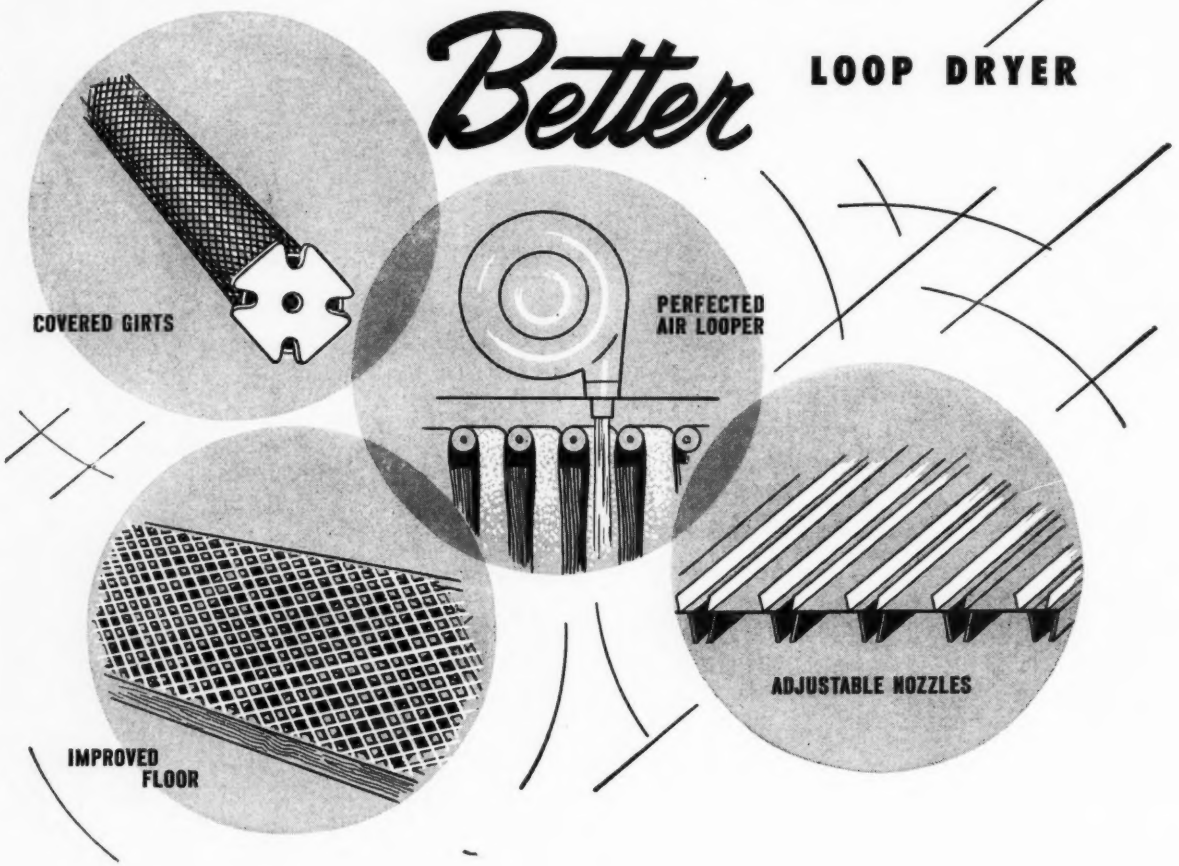
onyx CHEMICALS FOR DYEING AND FINISHING

IT'S THESE "LITTLE" THINGS THAT MAKE A *Better* LOOP DRYER



On the surface, you may be inclined to say to yourself, "a loop dryer's a loop dryer", and let it go at that. While the principle may be the same, there is a big difference in loop dryers. There are incorporated in the latest model Proctor loop dryers many refinements that definitely make for superior performance. For example, girts are covered with a treated covering that prevents cloth from adhering and eliminates the danger of "stick marks" in the finished goods. In addition to being covered, girts are designed to revolve at given intervals so that no part of the material is in contact with any part of the girt for any appreciable time.

To aid in forming smooth loops in certain classes of goods, the perfected air looper—another Proctor feature—is proving invaluable. A carefully timed jet of air is forced down into the loop as it begins to form, thus assisting in forming perfect loops, even in "difficult" material.

Because certain types of fabrics require more or less air than others—it is possible to regulate the air circulation in the Proctor dryer by means of adjustable nozzles. An exterior adjustment makes this a simple operation and also permits the operator to determine the exact amount of air circulation taking place inside the machine. Swirling and creases are eliminated, resulting in better finished fabrics.

A strengthened, stamped mesh floor simplifies cleaning and prevents undue accumulation of lint inside of the dryer.

If you are not already fully aware of the operating advantages offered by the Proctor loop dryer—you really owe it to yourself to investigate this machine without delay. Write today for details.

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SUNSHINE and SNOW FLAKES

Crystal-clean, sun-brilliant prints and warm, rich pastels are consistently assured with Keltex, the superior algin thickening agent.

Keltex, a product of nature rigidly refined to assure uniform results, is free of impurities and easily applied. Only a light wash is required for removal.

Adaptable to the pad pigment method of vat dyeing, Keltex provides effective control against pigment migration. It is equally effective in white discharge printing with hydro. In machine or screen printing, Keltex will insure a superior penetration and exact printing paste viscosity.

We will provide complete information on the adaptation of this extremely economical thickening agent to your individual application upon request.

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Water Conditioner

- Used on all textile fibers
- Used in all wet processes
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- Used in acid or alkaline water
- Used at all temperatures required in the industry

Calgon* will soften any water—prevent iron from interfering with any process—inhibit trouble from manganese in water—prevent scum formation—improve scouring conditions—prevent rancid odors in wool—assist in leveling and penetration of dyes—reduce crocking of dyes—assure brighter shades—disperse pigments—stabilize emulsions—improve sizing of warp yarns—prevent sludge in carbonizer.

Ever since 1933, when Calgon research first made phosphate treatment available to the textile industry, we have consistently made all of our water research findings available to textile chemists. Write for our technical bulletin, "Calgon Data for the Textile Chemist."

*T.M. Reg. U.S. Pat. Off.

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FOR CONVEYING, processing, and storage of corrosive fluids, whole systems are now built 100% of "Karbate" impervious graphite. Complete equipment is available—the pipe itself, fittings, valves, pumps, heat exchangers, towers—for processing HF, HCl, H_2SO_4, and many other chemicals.

This lightweight equipment is easy to install. The pipe is readily cut and fitted in the field.

Standard "Karbate" pipe sizes range from 1" to 10" i.d. A full assortment of fittings can be shipped for each size. All parts made of "Karbate" impervious graphite are strong . . . immune to thermal shock . . . and offer the highest resistance to corrosion of any practical high heat-transfer material.

For additional information on "Karbate" impervious graphite for handling corrosive fluids, write to National Carbon Company, Inc., Dept. AD.

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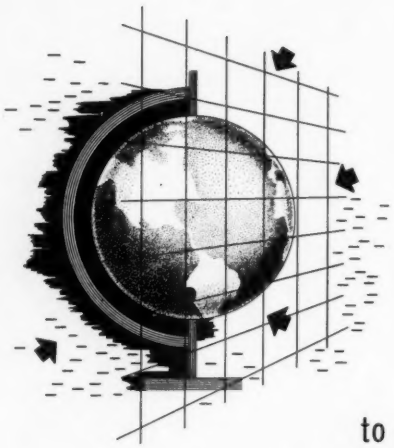

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There's a FALLEK Representative Everywhere!

Here is your opportunity to secure World Wide Distribution for American Dyestuffs ...

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92% of the world's total exports in Coal-Tar Colors, Dyes and Stains were supplied by Europe to the rest of the world.*

4.6% of the world's total exports in Coal-Tar Colors, Dyes, and Stains were supplied by the United States to the rest of the world.*

With foreign production at a minimum level, now is the opportune time for American Suppliers to secure a solid foothold in the most lucrative overseas markets . . . and here is how FALLEK can help you:

FALLEK ... eliminates costly credit risks. *You receive your check when your goods are ready for shipment* . . . as simple as a domestic transaction, but larger profits.

FALLEK ...creates an acceptance for your products throughout world markets that assures continuous business.

FALLEK ... gains you the proper entree with leading firms of known responsibility.

FALLEK ... gives you intelligent, daily sales coverage through representatives located in every world market.

FALLEK ... means permanence, through long established outlets in Europe, Latin America, and the Orient.

FALLEK ... saves you the detail handling and numerous expenses of operating an export department.

FALLEK ... brings you men of wide experience, men highly skilled in the problems of world distribution . . . plus skilled technicians in every foreign office fully equipped to render all the technical information necessary to users of American Dyestuffs.

American dyestuffs for textiles, leather, paper, etc., are in urgent demand throughout the world. You can realize a sizeable share of this business by making FALLEK your foreign selling agents. THIS is the time to safeguard profits against the hazards of "buyer's market" or a falling off in domestic demand, by developing a substantial export volume. FALLEK can do this for you.

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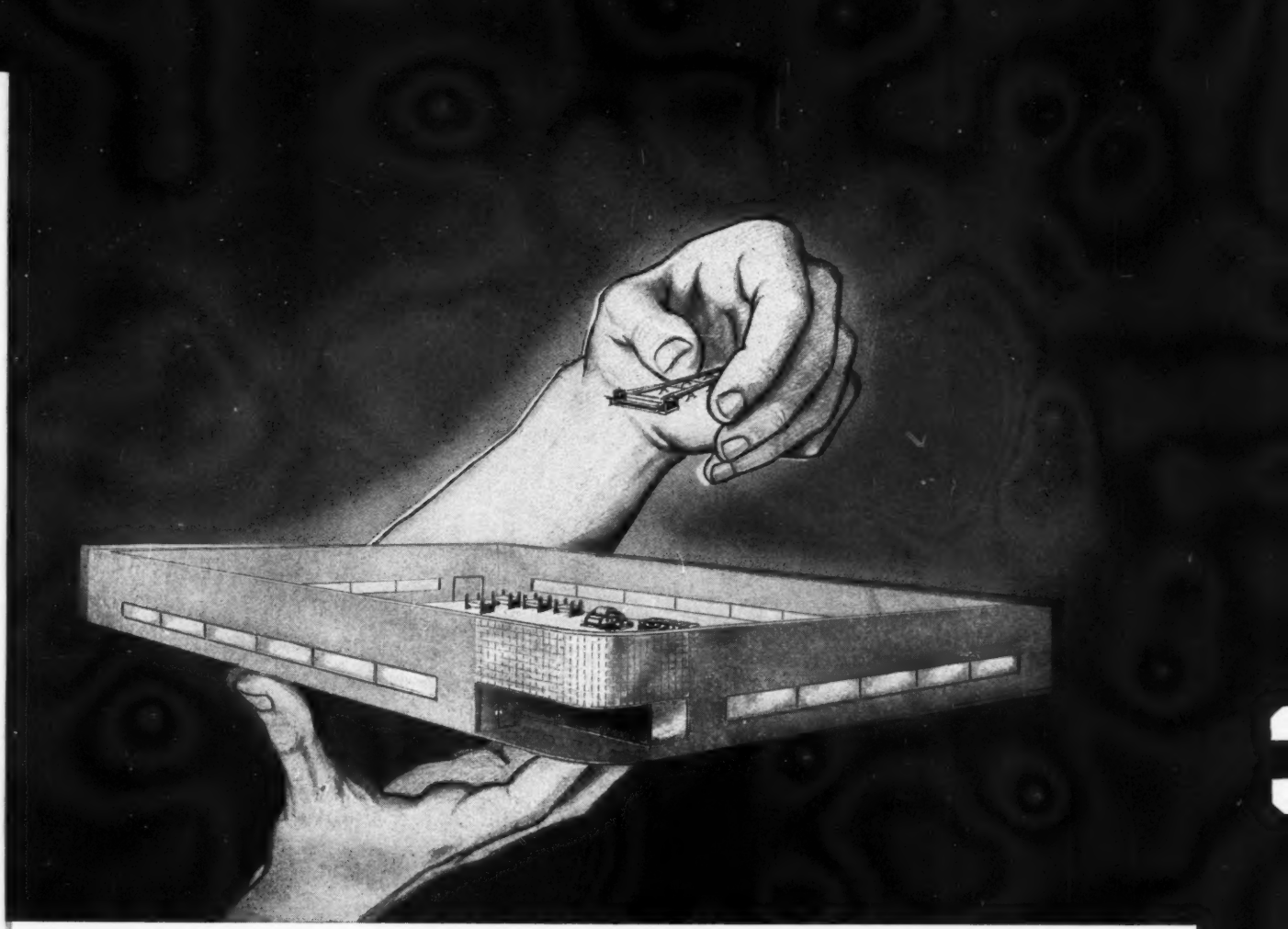


A SINGLE MACHINE OR AN ENTIRE PLANT!

Van Vlaanderen engineers are prepared to help you design a complete dyeing and finishing plant—or will help you select a single machine to meet a special need.

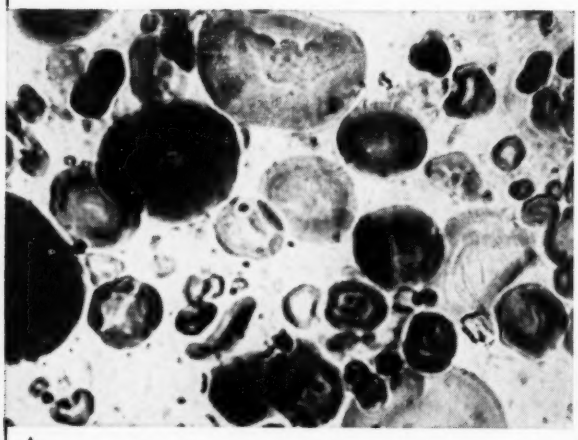
The Van Vlaanderen equipment you buy now will be better too—giving greater production and higher quality in processing modern fabrics. Discuss your requirements with us.

VAN VLAANDEREN MACHINE COMPANY

370 Straight St., Paterson 3, New Jersey • Cable Address: VLAANDEREN, PATERSONNJ, U.S.A.

World's largest manufacturer of machines for processing modern fabrics

VAT PASTE



A

heated for 15 minutes at 210° F by conventional open kettle methods.

B

heated for 30 seconds at 230° F by continuous, closed Votator method.

Dollars Worth of Difference

PHOTO-MICROGRAPH "A" shows the unexploded starch when vat paste is cooked at the maximum temperature for open kettle methods. Photo-micrograph "B" shows the more homogenous texture obtained with VOTATOR starch processing apparatus.

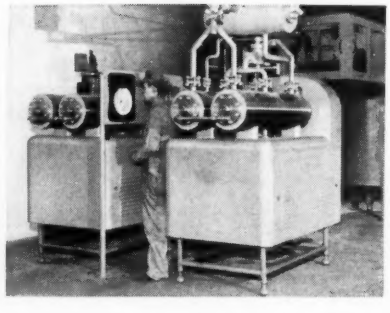
All the particles of starch are exploded because VOTATOR apparatus permits higher cooking temperatures. *Cooking and cooling are accomplished in one-thirtieth of the time required by open kettle methods*, as the material flows through the VOTATOR heat transfer tubes on a continuous basis, under closed, controlled conditions.

The VOTATOR operation incorporates scientifically determined agitation which uniformly affects all of the material. And you get unusually fine paste of uniform quality at unusually low processing cost.

VOTATOR starch processing apparatus meets or beats open kettle volume in half the floor space required by open kettle equipment. It requires less than half the man power. It eliminates spillage and spoilage, removes the hazard of slippery floors.

THE GIRDLER CORPORATION, VOTATOR DIVISION
LOUISVILLE 1, KENTUCKY

150 Broadway, New York City 7 • 2612 Russ Bldg., San Francisco 4 • 617 Johnston Bldg., Charlotte 2, N. C.



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Votator — INDUSTRIAL STARCH PROCESSING APPARATUS

SUN-loving colors...

CALCOSOL* and CALCOLOID*

Vat Dyes

Possessing extraordinary fastness to sunlight, salt water, perspiration, chlorine and exposure to weather, CALCOSOL and CALCOLOID vat dyes quite naturally "take to the sun." That's why they're ideal for play clothes and beachwear made of cotton, linen, rayon and mixtures.

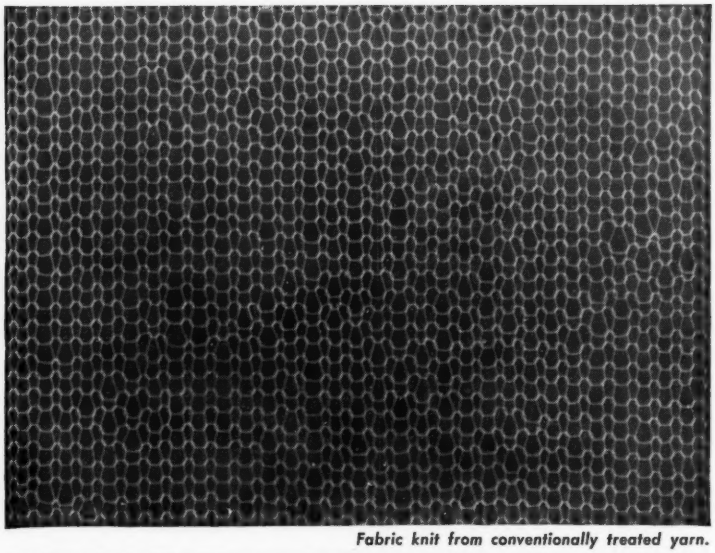
Your Calco representative will gladly advise you on the superior characteristics and the wide range of colors offered in CALCOSOL and CALCOLOID vat dyes. CALCO CHEMICAL DIVISION, AMERICAN CYANAMID COMPANY, Bound Brook, New Jersey. New York, Chicago, Philadelphia, Boston, Charlotte, Providence.

*Trademark

Reprints of this advertisement suitable for framing and without text will be sent on request.

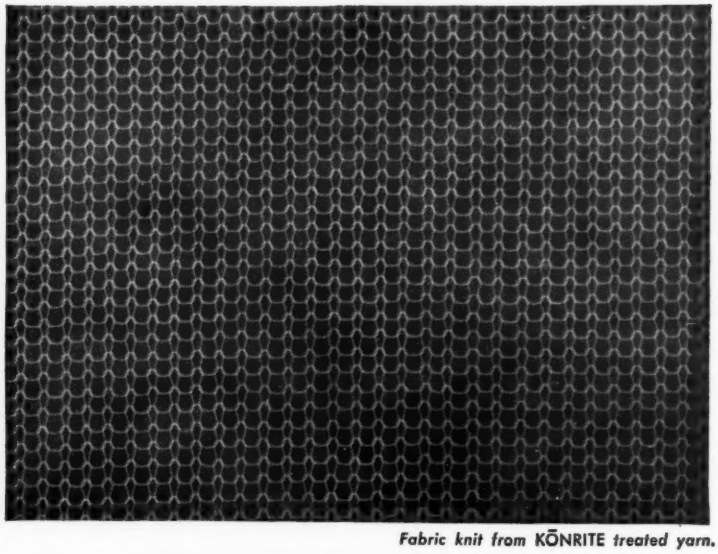
Calco

Is your stitch like this



Fabric knit from conventionally treated yarn.

or like this



Fabric knit from KŌNRITE *treated yarn.*

For the treatment of yarns for truly fine hosiery, Nopco presents KŌNRITE, a new and unique nylon coning oil. In Coning, Knitting, Seaming, KŌNRITE offers you:

OUTSTANDING RESULTS...

- ... ***in Coning*** — produces cones of proper density, practically eliminating overlaps, crossovers and underwinds
- ... increases cone production
- ... ***in Knitting*** — minimizes stripping of size — reduces pressoffs
- ... gives clear perfect stitch formation
- ... ***in Seaming*** — reduces roll ... its strong defense against curling is a major factor in greatly increased hosiery production

OUTSTANDING ADVANTAGES...

- ... Controlled viscosity, assuring even distribution of oil on yarn
- ... New stitches firmly cemented through rapid drying action
- ... Prevention of softening in lagged yarn and fabric

For full information on KŌNRITE, *please write today.*

NOPCO CHEMICAL COMPANY, Harrison, N. J.

Formerly National Oil Products Company

BRANCHES: BOSTON • CHICAGO • CEDARTOWN, GA. • RICHMOND, CALIF.

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Kōnrite — The Outstanding Nylon Coning Oil

kier boiling··
scouring···
boiling off

In handling wool . . . cotton . . . or silk, the efficiency of your scouring or boiling operations depends mainly on the quality of the chemicals you use. Whether your process calls for Trisodium Phosphate, Tetrasodium Pyrophosphate, Sodium Metasilicate, or Sodium Silicate, you can be sure of your selection if you always—

Photo courtesy of Pepperell Mfg. Co.

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Select Your Basic Textile Chemicals from these General Chemical Products

- Aqua Ammonia
- Acetic Acid
- Hydrofluoric Acid
- Muriatic Acid
- Sulfuric Acid
- Epsom Salt
- Glauber's Salt
- Sodium Bifluoride
- Sodium Bisulfite, Anhydrous
- Sodium Hyposulfite
- Sodium Metasilicate
- Sodium Silicate
- Disodium Phosphate, Anhydrous
- Tetrasodium Pyrophosphate
- Trisodium Phosphate
- Sodium Sulfide
- Oxalic Acid
- Chrome Alum
- Ferric Sulfate *(Iron Copperas Nitrate)*
- Sodium Sulfite, Anhydrous
- Nitre Cake *(Sodium Bisulfate)*
- Nitric Acid
- Mixed Acid
- Aluminum Sulfate
- Lead Acetate
- Aluminum Chloride, Solution

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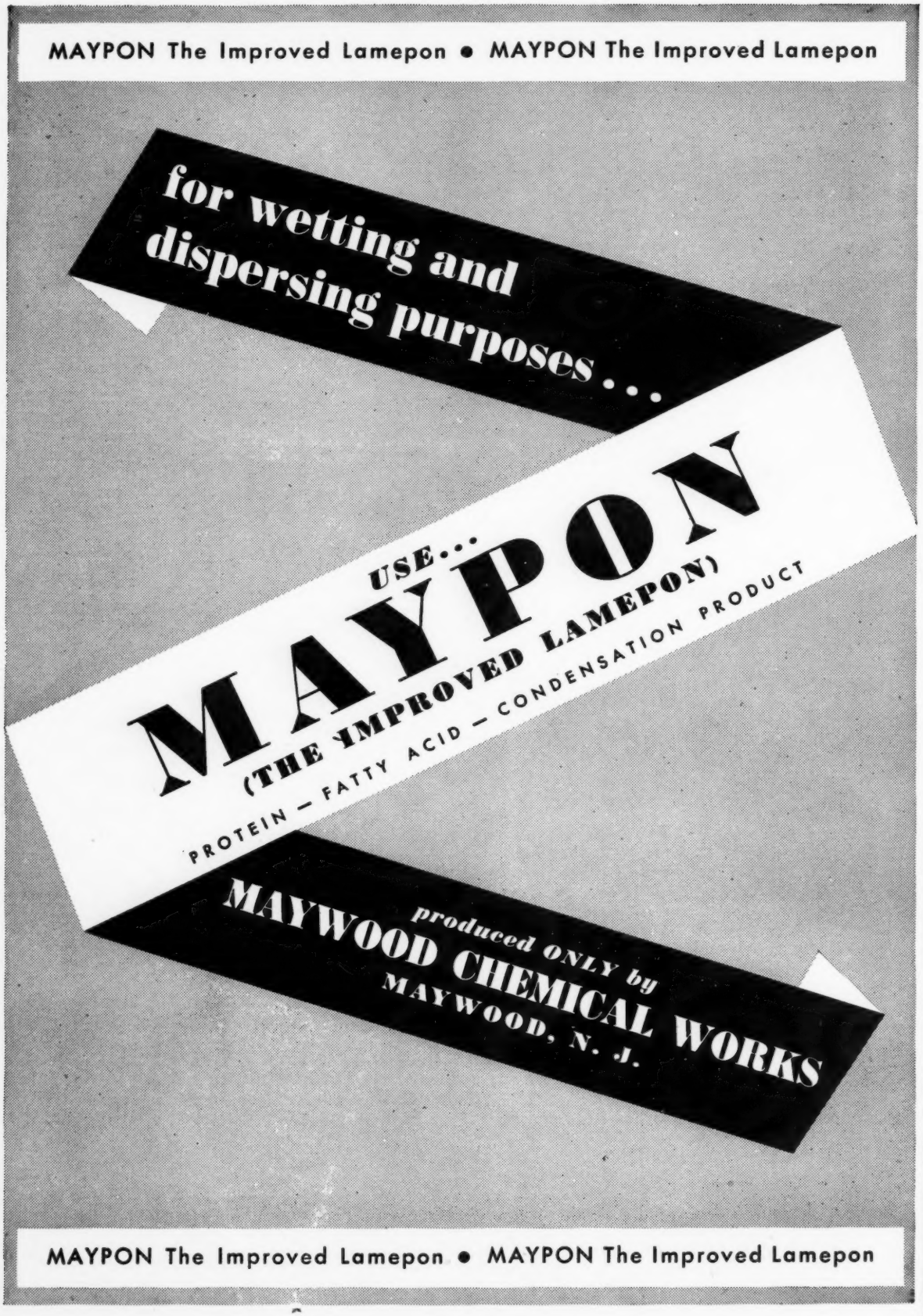
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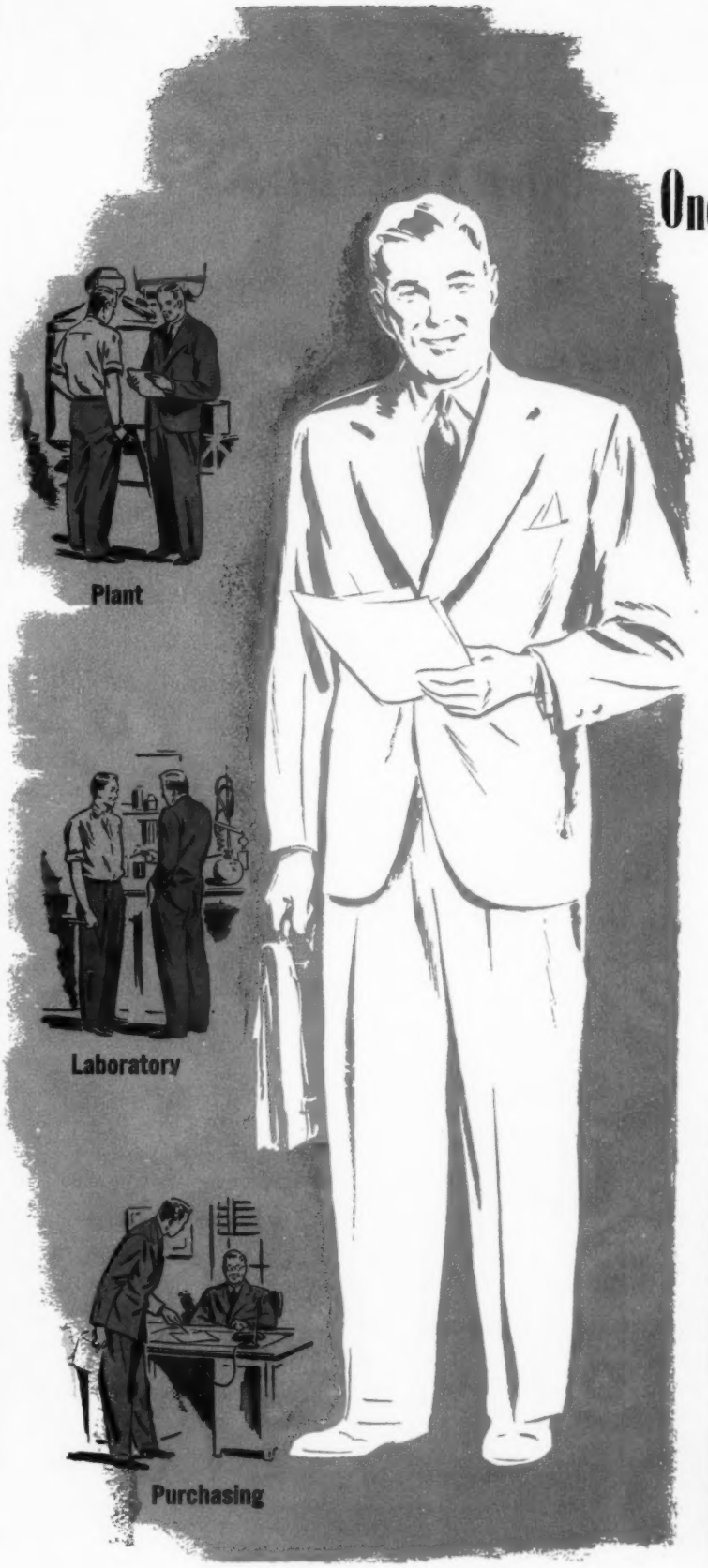

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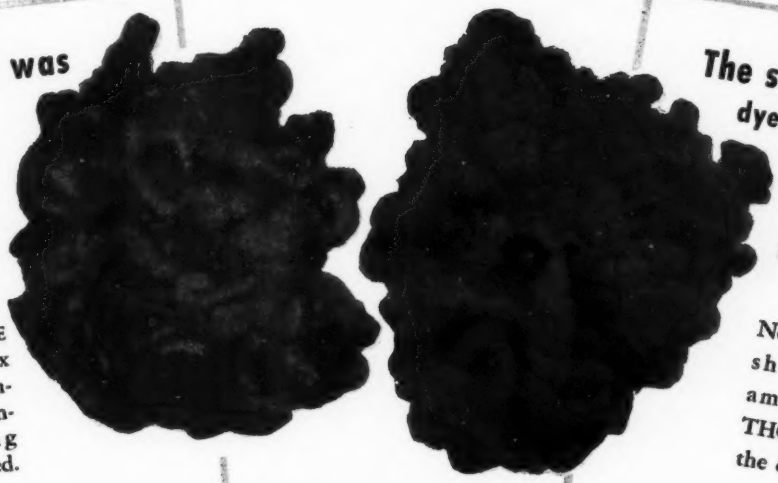

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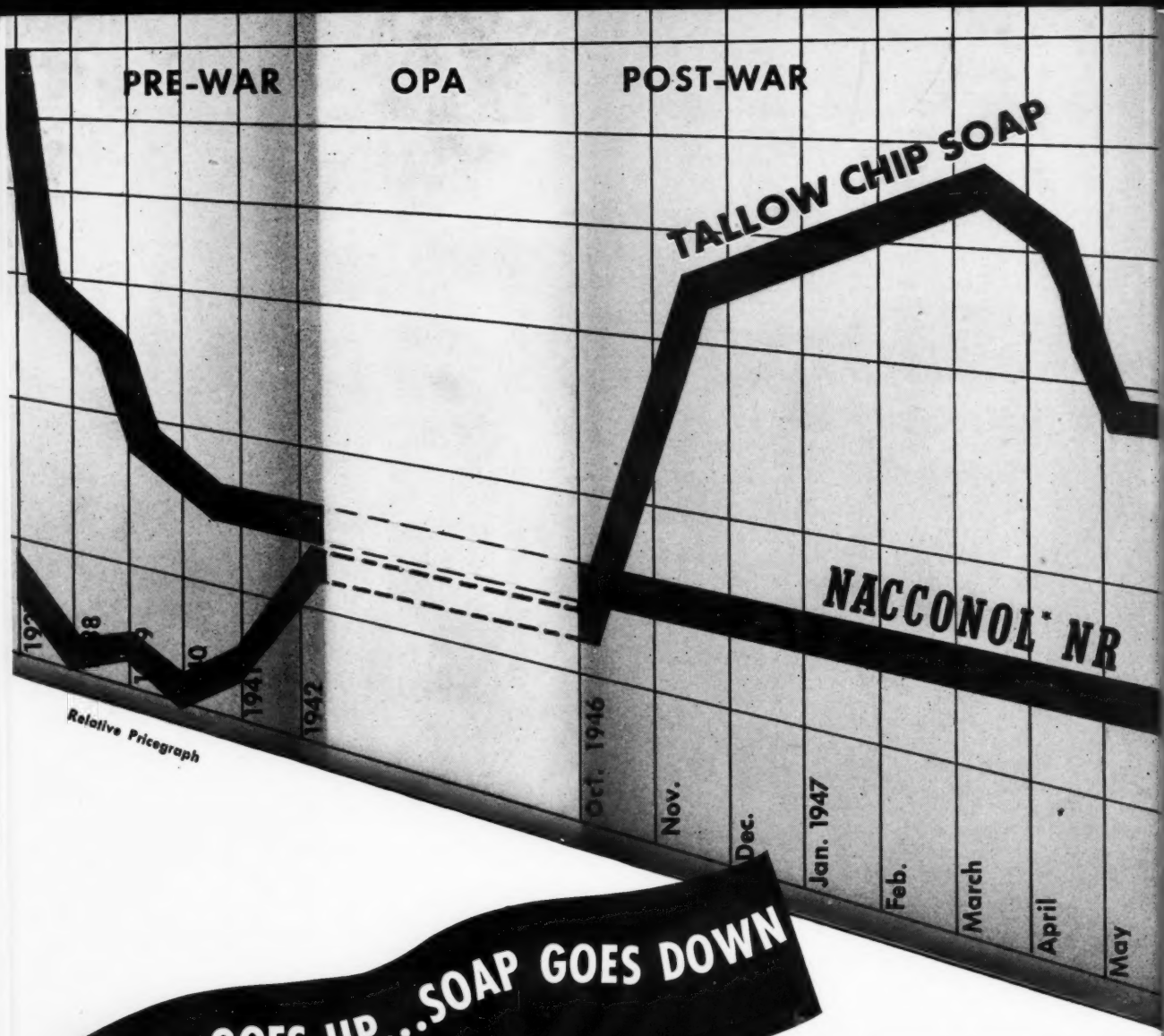

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AMERICAN
DYESTUFF REPORTER

VOLUME 36 AUGUST 11, 1947 NUMBER 16

Studies of Wool Dyeing

Comparison of Methods for Applying Chrome Colors*

GEORGE L. ROYER, HENRY E. MILLSON, and CHESTER A. AMICK

Calco Chemical Division, American Cyanamid Company, Bound Brook, New Jersey

Summary

When a wool staple is dyed with certain chrome dyes the tip portions are heavily dyed and the body portions are undyed or only lightly dyed. Cross-sectional examination shows that the tip portions of such a staple are heavily dyed, the body portions are undyed and the intermediate portions are "ring" dyed, the thickness of the "rings" being greater toward the tip portions. This variation in dye penetration is caused by the condition of the epidermis of the wool fiber, and if this epidermal layer is broken or "damaged" the dye will penetrate the fiber more readily. When the dyed staple is carded or when wool is dyed after carding, the cross-sections show unlevel distribution of dye from fiber to fiber. This fiber unlevelness causes poor color values, skittery or heathery effects, and indicates an inefficient use of dye. Exhaustion curves show that there are variations in wools from different regions and after physical and chemical processing. These variations increase the possibility of fiber unlevelness when various wools are blended together.

Wool exhibits reactivity in aqueous solutions and induces changes in pH both above and below the isoelectric zone, viz. pH 4-5. When a wool dyebath is made alkaline with ammonia at the start of the dyeing operation there is a gradual change in pH during the dyeing process, which influences the chromation, the decomposition of dye by oxidation and the exhaustion.

Wool can be successfully dyed with chromable dyes which are not usually applied by the metachrome method. This can be accomplished by dyeing in a bath which initially has a pH greater than 7, by using an optimum low percentage of bichromate, by having magnesium sulphate present, and by employing a surface-active agent as a dyeing assistant. This procedure has been called the Calcomet process. The addition of magnesium sulphate to the alkaline dyebath results in the formation of a magnesium-dye complex without appreciably affecting the pH. The magnesium complex, however, appears to be unstable below a pH of about 7. The use of the specially designed surface-active agent as a dyeing assistant promotes dye exhaustion from the alkaline bath and also causes the exhaustion of any chromium-dye complex that is formed in the bath. Consequently, good penetration and levelness of shade are obtained.

The top chrome, bottom chrome, metachrome and Calcomet methods were compared in the laboratory using several chrome dyes, and a detailed comparison of the various methods are made with Calcochrome Red ECB in regard to rate of dyeing, rate and extent of chromation, pH and the completeness of exhaustion.

IN the application of chrome dyes to wool, the different methods of dyeing produce results which show good fastness to light and washing. Many excellent papers have been written on the application of chrome dyes to wool *(1, 2, 3, 4, 5, 6, 7)*, and no attempt will be made to review the published work. This paper reports some of the observations that have been made on chrome dyeing in the Calco laboratories.

* Presented by Dr. G. L. Royer at the Midland and West Riding Section meetings of the Society of Dyers and Colourists in England, April 12 and May 1, 1947. Published in their Journal July, 1947.

Natural Variations in Wool

When fleece is dyed with certain dyes, tippy dyeing results. von Bergen *(8)* was the first to discuss this from a technological point of view; dyes that colored the tips darker, he termed "positive", and those that did not dye the tips he termed "negative." Color Plate Figure 1 shows a staple from a South American B. A. fleece dyed metachrome with Calcochrome Red ECB (C.I. 652), which is a positive dye. Color Plate Figure 2 is a microscopical longitudinal view of the tip and body portions of a single fiber from this staple. It can be seen that the body portion still has a definite scale structure, while the tip portion appears to have been changed by the weathering action of the sun, rain, and other natural causes. The dye has penetrated into the tip portion but not into the body portion. This is confirmed by cross sections of the body portion, Color Plate Figure 3, and tip portion, Color Plate Figure 4, of a number of fibers taken from the same staple. This indicates that the penetration of such a dye into wool fibers is controlled by the epidermis or scale layer. Color Plate Figure 5 shows a view of a dyeing of an orange chrome dye being carried out under the microscope on a heated stage, so that the dye bath was kept just under the boil. It will be noted that one fiber

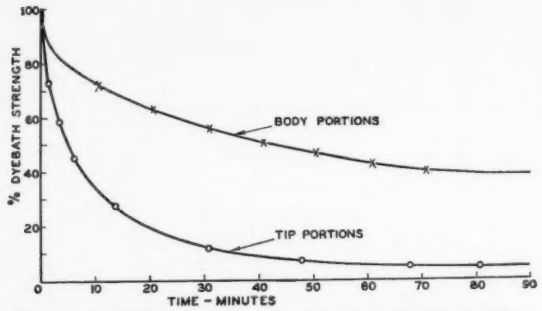


Figure 1—Exhaustion curves of body and tip portions of same fleece dyed at a pH of 4.3 with the half chrome complex of Calcochrome Red ECB.

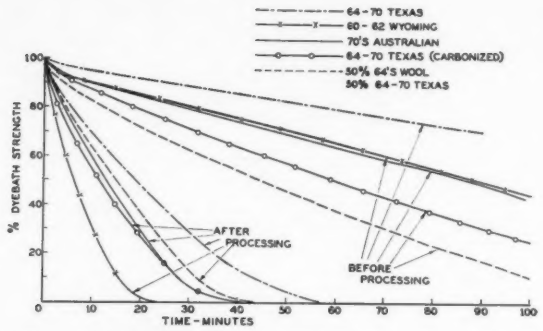


Figure 2—Exhaustion curves for five different wools dyed with Calcomine Fast Red 8B before and after processing.

has dyed throughout, while most of the other fibers are dyed only through the cut ends. A similar microscopical dyeing which demonstrates that the condition of the epidermis layer is an important factor in the control of dye penetration is shown in Color Plate Figure 6. Here a normal wool fiber has been crushed so as to break or crack a portion of the epidermal layer and then dyed. After this mechanical treatment, the dye penetrated rapidly into the fiber at the place where the break occurred. Otherwise, it did not penetrate except at the cut ends.

When a dyed staple, as shown in Color Plate Figure 1, is carded, there is a blending of tips and body portions. When this carded sample is viewed in cross section under the microscope, Color Plate Figure 7, it will be seen that some fibers are heavily dyed, some are "ring" dyed, and some are undyed. The heavily dyed fibers are the tip portions, (Color Plate Figure 4), the undyed fibers are the body portions, (Color Plate Figure 3), while the "ring" dyed are the portions of the fiber between the tip and body. The depth of the penetration of the dye or the thickness of the "ring" in the cross section has been shown to vary from complete penetration in the tip to practically none in the body portion. The same results are obtained if the fleece is carded first and then dyed as above. This phenomenon has been termed "fiber unlevelness" or "fiber selectivity" *(9);* it is the cause of the so-called heathery or skittery appearance of such dyeings and shows an inefficient use of dye resulting in poor color value *(10)*. Barr, Rowe, and Speakman *(11)* have confirmed this cause of skitteriness and have shown experimentally that it is "due to different degrees of swelling, resulting from different degrees of damage." There are some dyes, such as Calcochrome Yellow NFC (Pr. 1), which dye the same blend of wool uniformly from fiber to fiber as can be seen in the cross section in Color Plate Figure 8. Such dyes are said to dye fiber-level and are not fiber-selective, and they give a solid full shade with no skitteriness. Chrome dyes exhibit all gradations of fiber-levelness between these two extremes. Experiments have shown that some dyes exhibit this fiber-selectivity even after one to eight hours at the boil. If after this time a dye which dyes fiber-level is added to the dye bath, it will quickly dye all the fibers uniformly. The same quick level dyeing is obtained if the level dyeing dye is added to the bath initially instead of after boiling for several hours.

Dye exhaustion curves are another means which have been used to show differences in wool by the rate of dye removal from the dye bath. These exhaustion curves were obtained with an instrument known as the Dyeometer *(12)*. Figure 1 shows the difference in exhaustion between the tip and body portions of the same South American B. A. wool. It is seen that the tips dye more rapidly than the body portions and exhaust the bath to a greater extent. So far in this discussion, only wool from the same part of the fleece or the two ends of the same wool hair have been discussel. It is well known that samples of wool from different breeds or geographical regions have different dyeing properties. The dye exhaustion curves shown in Figure 2 show this variation for several raw wools before processing and indicate that a difference still exists after processing. These wools differ in fiber size, which is known to be a factor in the rate of dyeing *(13)*. However, experiments carried out on 58's, 60's, and 62's wool from the same sheep showed only slight changes in dyeing rate but a difference in the reflectance or color value. It is concluded that the difference in exhaustion from one type of wool to another is greater than the variation due to fiber size. Therefore, in blends of wools, the variation of dyeing characteristics from fiber to fiber is more likely to cause fiber unlevelness than is a variation in the fineness of the fibers.

Process Variations in Wool

In addition to natural variations, the wool may have been subjected to various processing steps which influence the rate of dye exhaustion. A previous publication *(14)* discusses the effects of various pretreatments, such as scouring, carbonizing, neutralizing, fulling, chlorination, and treatment with alcoholic potash *(15)*, on the rate of exhaustion. Further investigations have been made on samples of wool removed after each step of a normal processing. Each sample was extracted with carbon tetrachloride and given a warm water rinse, so that wool grease and the soluble suint would not interfere with the results. It is seen in Figure 3 that each step, including chemical processes, such as scouring, and mechanical processes, such as carding, influences the dye exhaustion rate. Calcomine Fast Red 8B was chosen for these experiments because the exhaustion of this dye is influenced by changes in the wool. The dyeing rates before processing are compared with the dyeing rates after processing on a number of different wools in Figure 2. Thus when various pretreated wools are blended together and dyed, the problem of obtaining good fiber levelness is as great or greater than that which occurs with natural wool.

The Importance of Fiber Levelness

Good fiber levelness is important in order to obtain the best color value and fastness, and a solid shade with no skitteriness. Calcochrome Blue F4B (C. I. No. 180) was dyed as an acid dye at 150° F. (65.5° C.) with 10% Glauber's salt and 4% of 85% formic acid for 30 minutes. Color Plate Figure 10 shows the cross section of this dyeing. It is not fiber level. At this temperature either the condition of the fiber or the dyeing did not allow uniform diffusion to take place. The same dyeing was then placed in a new dyebath containing 10% Glauber's salt and 4% of 85% formic acid and boiled for one hour. A cross section of the dyeing which resulted is shown in Color Plate Figure 11. Its fiber levelness is good and the color value is 125% when compared to

STUDIES ON WOOL DYEING:
COMPARISONS OF METHODS FOR APPLYING CHROME COLORS

Fig. 1. Wool Staple Dyed Metachrome with Red ECB

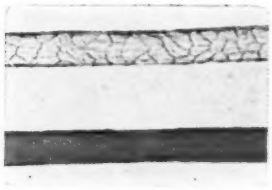


Fig. 2. Body and Tip portions from same fiber

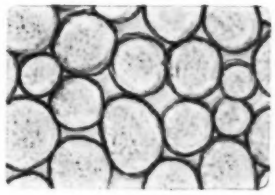


Fig. 3. Cross-section of Body Portion of Staple

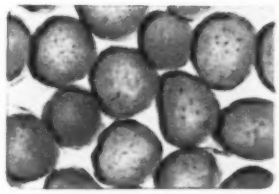


Fig. 4. Cross-section of Tip Portion of Staple

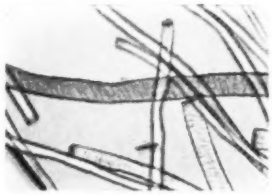


Fig. 5. Microscopical Dyeing with a Fiber Selective Chrome Dye

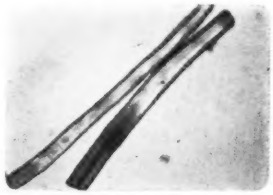


Fig. 6. "Crushed" Fiber Dyed with a Fiber Selective Chrome Dye

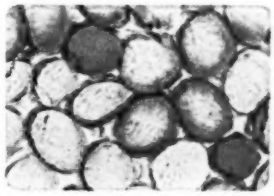


Fig. 7. Red ECB Dyed Staple Cross-sectioned After Carding

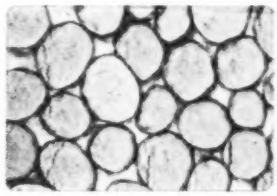


Fig. 8. Similar Staple Carded and dyed with Yellow NFC

Fig. 9. Blue F4B Dyed at 65.5° C., left; Same After 1 hr. boil, right

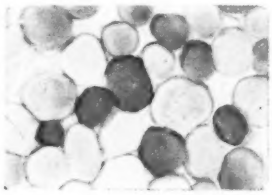


Fig. 10. Blue F4B Dyed at 65.5° C. for 1 hr.

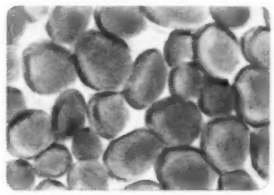


Fig. 11. Same Dyeing as Figure 10, boiled 1 hr.

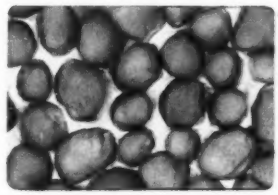


Fig. 12. Same as Figure 11, top chromed

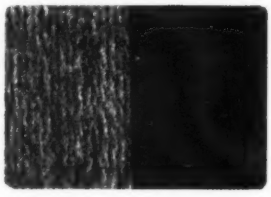


Fig. 13. Blue Black Conc., Metachrome—Calcomet

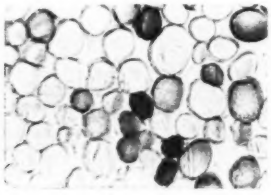


Fig. 14. Blue Black Conc., Metachrome

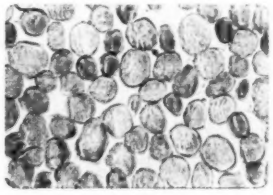


Fig. 15. Blue Black Conc., Calcomet

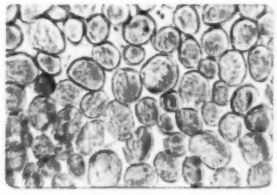


Fig. 16. Blue Black Conc., Top Chrome

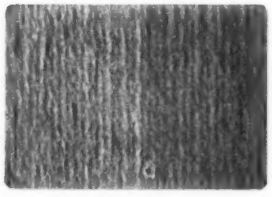


Fig. 17. Red ECB, Metachrome—Calcomet

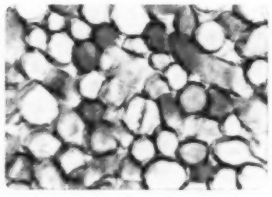


Fig. 18. Red ECB, Metachrome

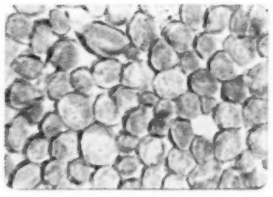


Fig. 19. Red ECB, Calcomet

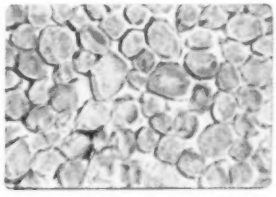


Fig. 20. Red ECB, Top Chrome

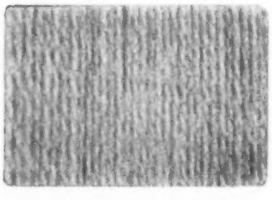


Fig. 21. Yellow CGW, Metachrome—Calcomet

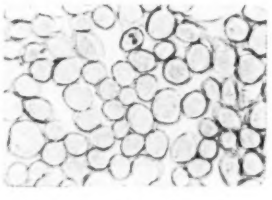


Fig. 22. Yellow CGW, Metachrome

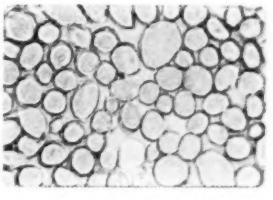


Fig. 23. Yellow CGW, Calcomet

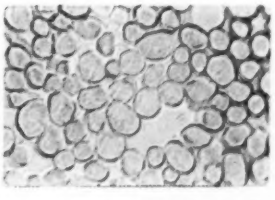


Fig. 24. Yellow CGW, Top Chrome

Photomicrographs made in laboratories of Calco Chemical Division, American Cyanamid Company, Bound Brook, N. J.

% DYEBATH STRENGTH

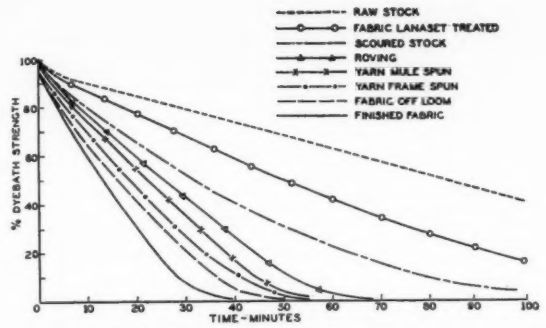


Figure 3—Exhaustion curves of 70's Australian wool after various processing steps.

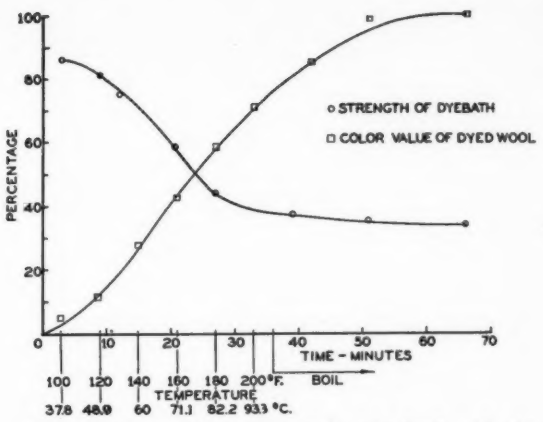


Figure 4—Curves showing strength of dye baths and color value of dyed samples at various temperatures and times during dyeing with Calcochrome Violet B.

the 150° F. (65.5° C.) dyeing as 100%. Yarns from these two dyeings are shown in Color Plate Figure 9. Color Plate Figure 12 shows the cross section of the boiled dyeing after it had been top chromed. It's fiber levelness is still excellent. This demonstrates the importance of the proper distribution of dye from fiber to fiber in order to obtain maximum color value.

With dyes which level easily, complete exhaustion does not guarantee maximum color value. For example, Figure 4 shows the exhaustion data, plotted as "strength of dyebath", for Calcochrome Violet B (C. I. 169), dyed as an acid dye before topchroming. The reflectance values for dyeings removed at the same temperature and time at which the exhaustion values were determined are plotted as "color value of dyed wool", in which all dyeings were compared to the final dyeing as 100%. Cross sections were made of these dyeings and microscopical counts *(16)* were made of the number of "ring" dyed, dyed and heavily dyed fibers. These values are plotted in Figure 5. It is seen from Figure 4 that the equilibrium absorption was obtained practically when the dyeing reached 190° F. (87.7° C.). At this point the color of the wool was only 65% of the final value obtained after boiling for 30 minutes. Thus the wool has increased 35% in color strength while the dye bath exhausted only 6%. Examination of Figure 5 reveals the location of the dye in the fibers during this same period. There was a maximum of heavily dyed fibers at 180° F. (82.2° C.) and the number of "ring" dyed fibers was rapidly changing to completely dyed fibers. The redistribution of the dye from fiber to fiber as the dyeing was continued, produced good fiber levelness and resulted in the development of color value on the wool. This emphasizes the fact that equilibrium dye exhaustion does not necessarily mean equilibrium or uniform distribution of dye throughout the material being dyed, and, until this is accomplished, the maximum color strength is not obtained.

Chrome Dyeing Methods

In view of the extreme variations which exist in wool and the attendant difficulty of obtaining acceptable results, it has been necessary to develop dyeing methods which minimize or overcome these variations. This has been accomplished in part by the selection and introduction of more suitable dyes as well as by modifying the chrome dyeing procedures. The dyer recognizes three general procedures, namely, bottom chrome, top chrome, and metachrome dyeing. The bottom and top chrome methods are well known and, in general, give satisfactory results with most chrome dyes. The bottom chrome method is tedious and time-consuming, but it does give dyeings with excellent fastness properties and solidity of shade. Recent crocking and microscopical studies *(17)* have included a discussion of some of the factors in bottom chrome dyeing. The top chrome method is simpler than the bottom chrome method and quite satisfactory for most chrome dyes. In this process, however, shade matching difficulties and tippy dyeings may be encountered.

The simplest method of applying chrome dyes is generally considered to be the metachrome method *(1)*, and while it offers distinct advantages over the other two processes, it also has some disadvantages. This method is extremely flexible and consequently variations are in use which account for the differences obtained in practice with the same dyes. The best metachrome dyes are those which

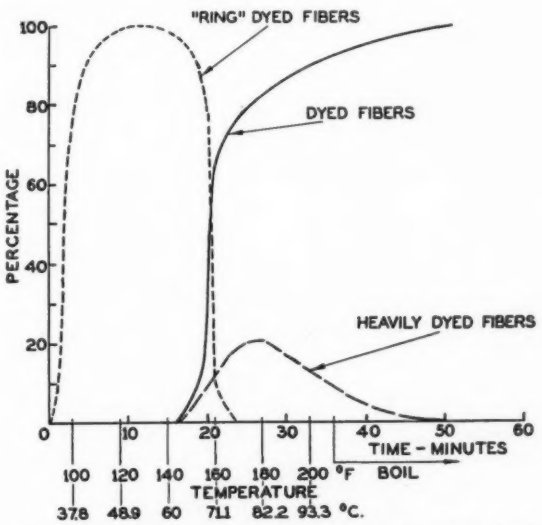


Figure 5—Curves showing percentage of "ring" dyed fibers, dyed fibers and heavily dyed fibers obtained from microscopical counts of cross sections of the dyeings plotted in Figure 4.

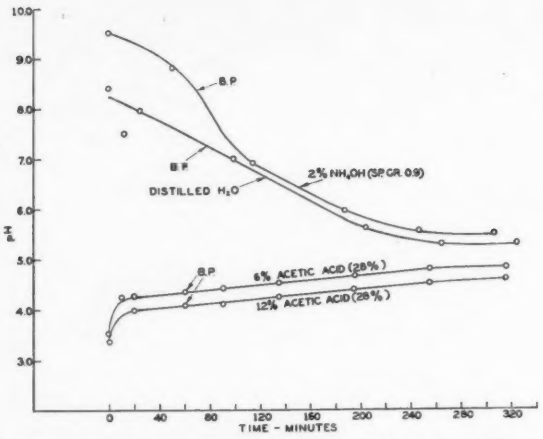


Figure 6—Curves showing changes in pH of solutions when wool is boiled therein.

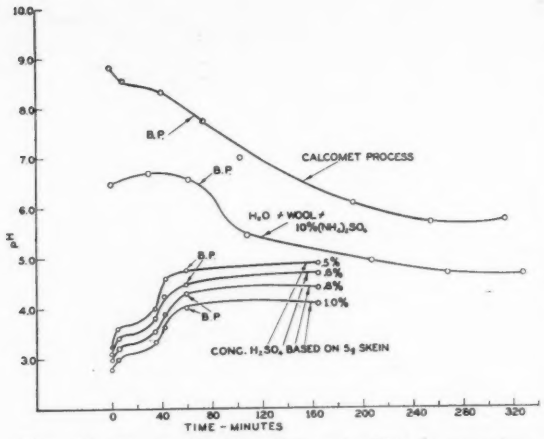


Figure 7—Curves showing changes in pH of ammonium sulfate and sulfuric acid solutions when wool is boiled therein.

exhaust well near the neutral point and require little if any forcing for economical exhaustion in coloring piece goods. Two-sided effects, poor penetration and excessive crocking due to surface dyeing are caused by too rapid exhaustion of the dye bath at or near the boil. Chromation of the dye takes place rapidly in acid dye baths at elevated temperatures, and care must be exercised during dyeing to prevent the formation of the chromium complex before the dye has been absorbed by the fiber. Little, if any, leveling action is obtained after the dye has been exhausted and chromed on the fiber. Many well known chromable dyes give extremely poor results by all of the ordinary metachrome methods. Many other chrome dyes give only fair results and fail to produce fiber-level shades, regardless of the modifications which may have been made in the method of application. Rich, heavy bodied shades are difficult if not impossible to obtain, because the colors do not build up proportionately as they do when applied by the top or bottom chrome methods. Because of the advantages offered by the metachrome process, a study was made of this method, and the important factors which influence this method will now be considered in detail.

Reactivity of Wool

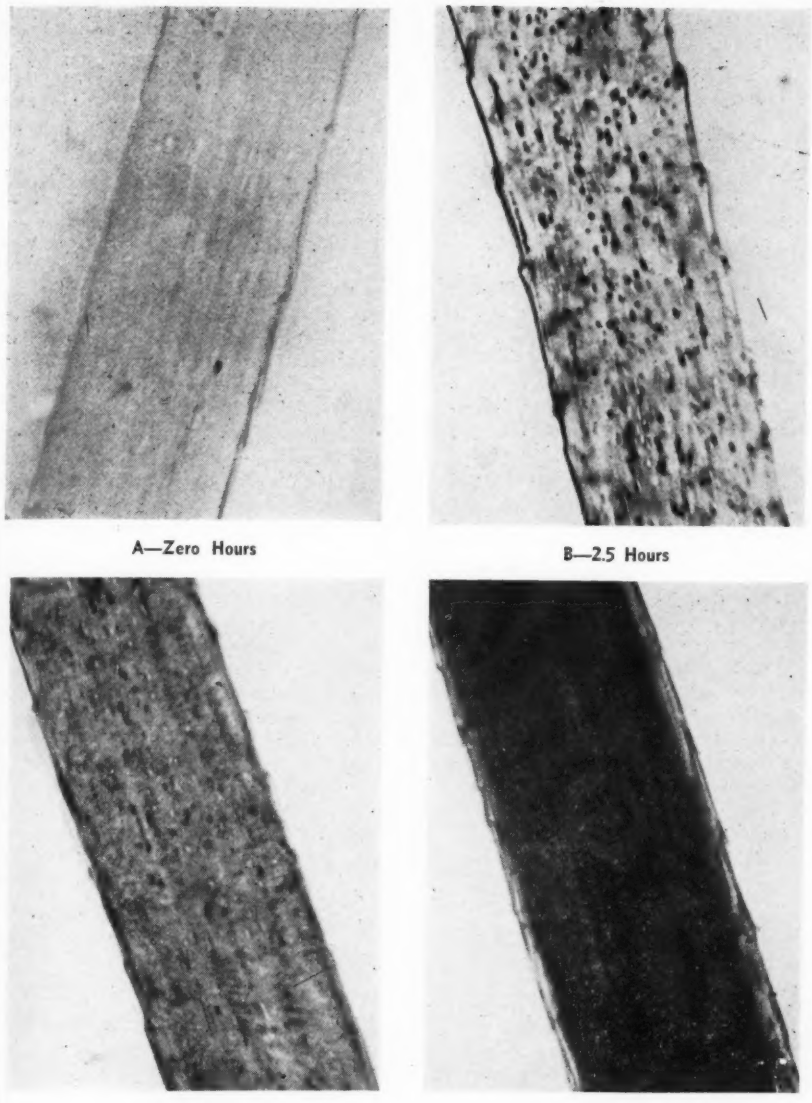
Proteins, such as wool, are known to be amphoteric. When immersed in aqueous solution having a pH below the isoelectric point, they become positively charged, and when immersed in an aqueous solution at a pH above the isoelectric point they become negatively charged. In the case of wool, it probably is better to speak of an isoelectric zone instead of an isoelectric point, the range of this zone being from pH 4 to pH 5, depending upon the type of wool and the specific conditions under which the mesaurements are made. Below the isoelectric zone, wool acts as if it were a base, and above this zone wool acts as if it were an acid. Therefore, it seemed desirable to determine the magnitude of the change in pH of the dye bath during the dyeing process, since this influences the chromation, the decomposition of the dye by oxidation, and the exhaustion of the dye bath.

The wool used was a 3-20s 9s A white French spun worsted yarn made from 64's Australian wool which had been 100% naphtha scoured. This wool was particularly well suited to this study because it had had no previous alkaline or acid treatment and a minimum of aqueous treatment. The various baths studied had a total volume of 400 ml. and were prepared with distilled water having a pH of 5.9, as determined by means of a glass electrode pH meter. A 5 gram skein of dry wool was entered into the bath at room temperature and turned until it was well wet out, and the pH of the bath was again determined. The baths were brought to the boil in approximately one hour and boiled for several hours. At various intervals, small samples were pipetted from the baths, cooled to 25° C. (77° F.) and the pH determined. Data were obtained from baths containing, respectively, distilled water, ammonium sulfate, ammonium hydroxide, two concentrations of acetic acid, and four concentrations of sulfuric acid. The results are illustrated by Figures 6 and 7.

Examination of the data illustrated in Figure 6 reveals that when the wool was entered into the distilled water and thoroughly wet out, the pH of the bath increased from 5.9 to 8.4. Since the wool had not been treated with soap or alkali of any kind in the scouring operation, this initial increase could have been caused by the hydrolysis of any suint remaining on the wool. As the heating and boiling continued, however, a gradual decrease in pH occurred, until finally the isoelectric zone was approached. This decrease in pH can be accounted for by assuming that the wool is acting as an acid, thus reducing the hydroxyl ion concentration until the neutral zone of the wool is approached.

Another factor which may affect pH change is the potential chemical decomposition of the wool itself. Support for this view is provided by single fiber stress-strain data obtained before and after boiling in distilled water. The reduction in work required for 30% extension was 10% after boiling for 1½ hr., 12% after boiling 4 hr., while after boiling 8, 9 and 24 hours respectively, each fiber broke. Microscopical longitudinal views of other fibers boiled for various times are shown in Figure 8. It is evident that the original fiber is quite transparent. After boiling for 2½ hours, the fiber has become pitted and somewhat darkened. On boiling for 16 hours, more pits are evident and the fiber has become quite dark. After boiling for 24 hours, the fiber is practically opaque due to a brown discoloration and to the presence of many pits. This is additional evidence of the degradation of wool when boiled in water. Still further evidence that marked changes occur in wool when it is boiled in distilled water is revealed by the increase in the rate of dye exhaustion *(15, 18)*.

Referring again to Figures 6 and 7, it will be observed that when ammonium hydroxide or ammonium sulfate was present, the addition of the wool caused an initial increase in pH followed by a gradual decrease as the boiling progressed, approaching that of the isoelectric zone as occurred when distilled water only was used. In the case of the am-



A—Zero Hours

B—2.5 Hours

C—16 Hours

D—24 Hours

Figure 8—Photomicrographs of fibers boiled in distilled water.

monium sulfate, the total change in pH was less than that for distilled water or ammonium hydroxide, probably because of the buffering action of the ammonium sulfate. This decrease is in agreement with the data of Stevens, Rowe and Speakman *(1)* and of Goodall *(19, 20, 21, 22)*.

It also seemed important to determine what the change in pH of the bath would be if the initial pH was below the isoelectric zone. The experiments with acetic acid and sulfuric acid baths, illustrated by Figures 6 and 7, show that, as the wool is heated in the baths, there is a gradual increase in pH, again approaching the isoelectric zone. It should be noted that the final pH appears to depend, at least to some extent, upon the initial pH. However, when the amount of acid added initially is increased sufficiently, a point is reached where little if any change in pH is observed. This is due to the fact that the wool contains only sufficient acid-neutralizing groups to combine with a limited quantity of acid. These experiments show that the ability of the wool to produce a change in pH and possible modification in the wool structure itself is superimposed upon the normal effects of the chemicals which are present in the dye bath.

Chromation

In the detailed study of chromation, the dyes used were Calcochrome Blue Black Conc. (zinc salt, C.I. 202) and Calcochrome Blue Black ZF (zinc-free, C. I. 202). These were chosen for detailed study after an investigation of a considerable number of chrome dyes, because they could not be applied by the regular metachrome process, and so were of value in emphasizing variations in the dyeing process. In the chromation process, chromate or bichromate is used generally as the source of the chromium for the metallization of the dye to form the chromium-dye complex. Calcochrome Blue Black ZF is obtained by diazotizing 1-amino-2-naphthol-4-sulfonic acid and coupling with beta naphthol. A possible structure for the chromium complex is shown in Figure 9. This structure is based on a general theory similar to that proposed by Race, Rowe and Speakman *(23)* for chrome-dye complexes. This formula requires that the chrome be present in the trivalent or reduced form. In chromate or bichromate, the chromium is present in the hexavalent or oxidized form. It is quite evident, therefore, that when chromate or bichromate is added to the dye bath, the hexavalent form must be reduced to the trivalent form, a reaction which takes place more readily in acid solution. Since no other reducing agent is present, either the dye or the wool must be responsible for the reduction. If the dye is preferentially oxidized, then some color may be lost. If the wool is oxidized, it is then undergoing a further chemical change in addition to that produced by boiling water.

In order to attain greater efficiency of dyeing, it would seem that the bath conditions should be adjusted to minimize the above oxidation effect. Therefore, a study was made to determine whether chromation could be effected in more alkaline dye baths containing less bichromate. Experiments were made using 2% of dye on a 5 gram wool skein in a 400 ml. bath. In each case, the bath was brought to the boil in 30 minutes, 2% and 4% of 28% acetic acid being added after 30 and 60 minutes on the boil, respectively. The percentages of bichromate added were 1.0, 0.8, 0.6, 0.4, and 0.2. Dyeings with each of these percentages of bichromate were made in baths containing 10% of ammonium sulfate, 2% of ammonium hydroxide, (Sp. Gr. 0.90) and 10% of ammonium sulfate with 2% of ammonium hydroxide. (All percentages are on the weight of wool). The color values for each of these dyeings as determined by the spectrophotometer are illustrated by curves 1, 2 and 3 of Figures 10 and 11.

With Calcochrome Blue Black Conc.- ammonium hydroxide gave an increase in color value, while with the Blue Black ZF there was no improvement. The adjustment with ammonia to a pH of 9.5, regardless of whether or not ammonium

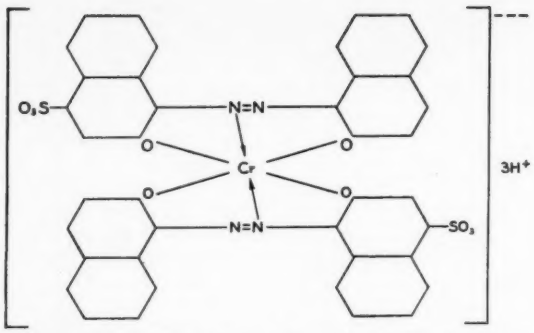


Figure 9—Possible structural formula of the chromium complex of Calcochrome Blue Black ZF.

sulfate was present, did not show sufficient improvement to be of practical value. The use of ammonium sulfate alone was even less effective. The important observation that resulted from these experiments was that the color values increased as the amount of bichromate was reduced. With concentrations of bichromate of less than 0.2%, the shade of the finished dyeing had a reddish tone, indicating that the dye was incompletely chromed. These experiments reveal that a proper minimum amount of bichromate gives the best color value.

Because of the wide variations in the chemical composition of chrome dyes, different dyes require varying amounts of bichromate, and even with the same dye, the chrome-dye ratio will vary depending upon the depth of shade and the conditions under which it is dyed. However, it should be noted that complete chromation is necessary for the development of maximum fastness properties. This complete chromation may be obtained more effectively in the laboratory under controlled conditions than in the average dyehouse where wide variations in dyeing may occur. Consequently, lower percentages of bichromate may be effective in the laboratory but these lower concentrations of bichromate may not produce the same results in the dyehouse.

Practical dyeings with Calchochrome Brown B (C.I. 101) a chrome color which normally presents difficulty in metachrome dyeing, were solved by using magnesium sulfate (Epsom salt). As a consequence, the use of magnesium sulfate for metachrome dyeing was extended to other chrome dyes. The results obtained when 10% of magnesium sulfate was incorporated in the dye bath, both with and without ammonia, along with various percentages of bichromate are illustrated by curves 4 and 5 of Figures 10 and 11. It will be observed from these curves that the color value increased appreciably as the concentration of potassium bichromate decreased and was superior to those obtained when ammonium sulfate was used. It will be observed that there was a marked increase in color value when magnesium sulfate and ammonium hydroxide were used together. When these dyeings using magnesium sulfate were examined visually and microscopically, the levelness from fiber to fiber was not equal to that of a bottom or top chrome dyeing of these same dyes in spite of the high color values.

This effect of the ammonium hydroxide-magnesium sulfate dye bath was observed with other dyes which are not dyed successfully by using metachrome mordant, although all dyes did not respond equally well. When the above dyeings, using Calcochrome Blue Black ZF, were made it was noticed that the addition of the magnesium sulfate to the ammoniacal solution of the dye appeared to cause a change in color. To confirm this, a dye

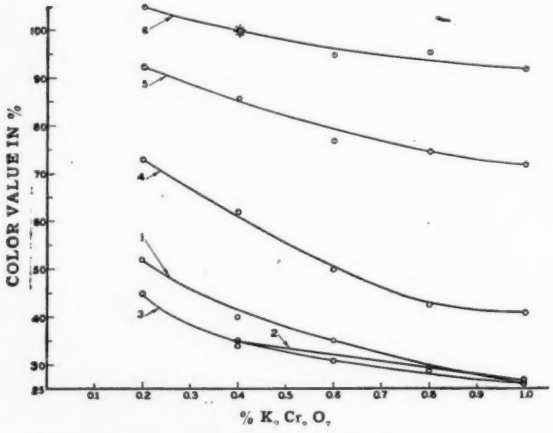


Figure 10—Curves showing the color values of dyeings of 2% Calcochrome Blue Black Conc. dyed in various salt solutions with different percentages of $K_2Cr_2O_7$. All percentages are based on the weight of the wool:

1—10% $(NH_4)SO_4$
2—10% $(NH_4)_2SO_4$ + 2% NH_4OH
3— 2% NH_4OH
4—10% $MgSO_4$
5—10% $MgSO_4$ + 2% NH_4OH
6—10% $MgSO_4$ + 2% NH_4OH + 2.5% Calcomet Salt

The value marked with an asterisk was used as 100%, and all color values were determined by means of the spectrophotometer.

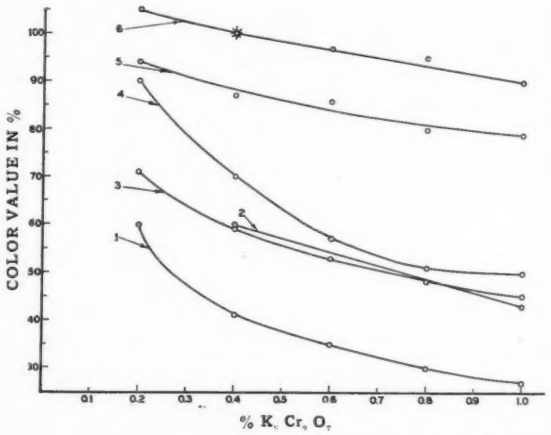


Figure 11—Curves showing the color values of dyeings of 2% Calcochrome Blue Black ZF dyed in various salt solutions with different percentages of $K_2Cr_2O_7$. All percentages are based on the weight of the wool:

1—10% $(NH_4)_2SO_4$
2—10% $(NH_4)_2SO_4$ + 2% NH_4OH
3— 2% NH_4OH
4—10% $MgSO_4$
5—10% $MgSO_4$ + 2% NH_4OH
6—10% $MgSO_4$ + 2% NH_4OH + 2.5% Calcomet Salt

The value marked with an asterisk was used as 100%, and all color values were determined by means of the spectrophotometer.

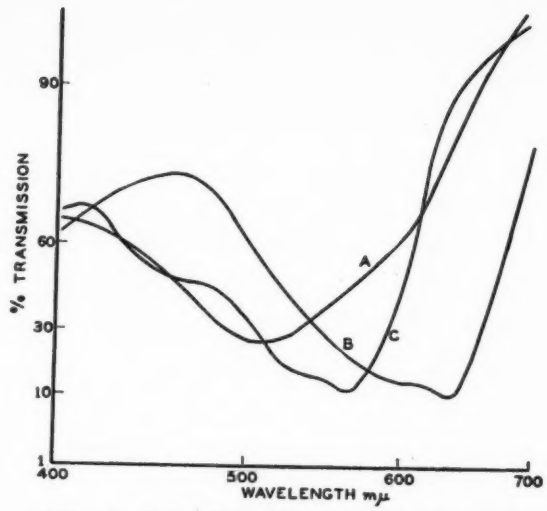


Figure 12—Spectrophotometric curves for Calcochrome Blue Black ZF:
A—Original dye in water.
B—After addition of ammonia to "A".
C—After addition of magnesium sulfate to "B".

bath was prepared by dissolving 0.1 g. of the dye in 100 ml. of boiling water, after which 300 ml. of cold water were added. At this point, the solution was a reddish violet (see Curve A in Figure 12). One-tenth of a gram of ammonium hydroxide (Sp.Gr. 0.90) was added (2% on the weight of a 5 gram skein) which caused the dye bath to change to a cornflower blue shade (see Curve B). The pH of this solution was 9.8. One-half gram of magnesium sulfate was then added and the cornflower blue solution changed to a cherry red (see Curve C) without any noticeable further change in pH. This result was quite unexpected and indicated that in some manner the magnesium sulfate had affected the chromophore group, forming a magnesium dye complex which appears to be stable in solutions above a pH of 7. There was no spectrophotometric evidence that this magnesium complex formed below a pH of 7.

When wool was dyed in the cherry red solution of the magnesium complex, the dye was exhausted from the bath, not as a cherry red, but as a strong reddish blue. Without the magnesium at this pH the same shade was obtained but the dyeing was considerably weaker. This would indicate that the magnesium complex as such does not dye on the wool.

Work with the magnesium complexes of many chrome dyes has shown that the presence of magnesium in an ammoniacal solution slows down the rate of chromation to a greater extent than when ammonia alone is used. However, the rate of exhaustion is increased when the magnesium complex is present. Consequently, the dye can be exhausted well on to the wool on the alkaline side and then, as the bath becomes less alkaline, as it does on continued boiling, the chrome complex forms on the wool rather than in the bath. Other salts of magnesium, such as the chloride or acetate, and other cations in Group II of the Periodic Table seem to show an effect similar to that obtained with magnesium sulfate, to the same or a lesser extent. It was for this reason that both zinc and zinc free types of C. I. 202 were studied.

Another factor observed in the experimental studies on chromation was that under normal metachrome dyeing conditions some dyes decomposed, while others did not. Calcochrome Blue Black Conc. is illustrative of the former, while Calcochrome Red ECB is an example of the latter. Chromation studies of these two dyes without wool being present were made in the Dyeometer (*12*), using a constant temperature of 80°C., a pH of 5.7 in the presence of an acetate buffer and at a concentration of 0.1 gram of dye in 400

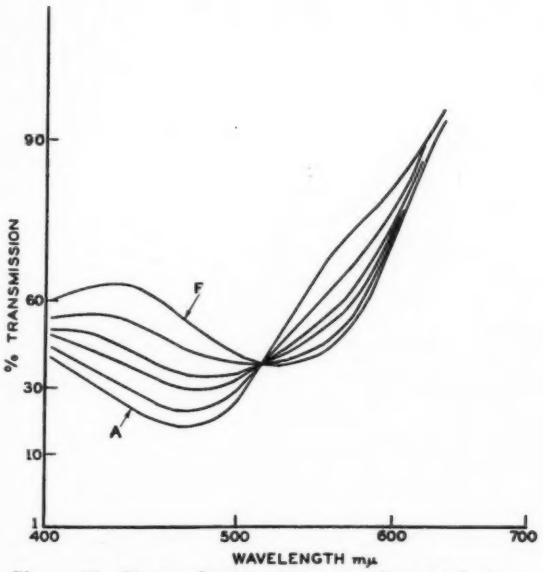


Figure 13—Spectrophotometric curves obtained during the chromation of Calcochrome Red ECB at 80° C. and a pH of 5.7 following the addition of 1% $K_2Cr_2O_7$ to the bath.

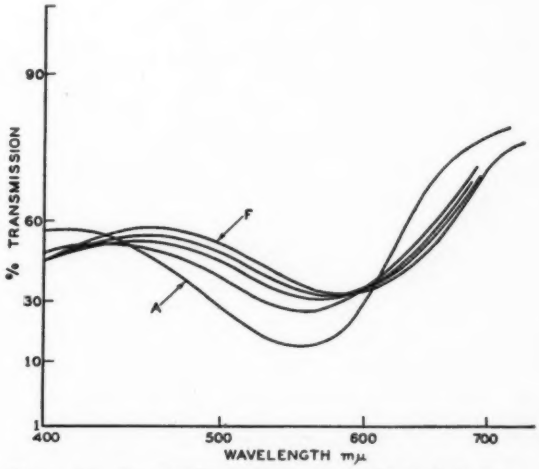


Figure 14—Spectrophotometric curves obtained during the chromation of Calcochrome Blue Black Conc. at 80 C. and a pH of 5.7 following the addition of 1% $K_2Cr_2O_7$ to the bath.

ml. The pH of 5.7 was chosen in order to use the average pH condition encountered in a commercial metachrome dye bath. Figures 13 and 14 show the spectrophotometric curves obtained in this study. Curve A in each figure is the initial spectrophotometric curve obtained before the addition of 0.05 grams of potassium dichromate. Curve F in each figure is the final spectrophotometric curve taken after 30 minutes of heating. All the other curves are intermediate stages between the two.

It is evident that all of the spectrophotometric curves for the chromation of Calcochrome Red ECB pass through one common crossing point known as an isosbestic point. This can be interpreted to mean a change from the unchromed dye to the chrome-dye complex with no loss in strength. With the Calcochrome Blue Black Conc., the curves do not have a common crossing point which indicates that some decomposition may have taken place. From this information, it is clear that at least part of the low color value of Calcochrome Blue Black Conc., and similar types is due to decomposition during dyeing in ammonium sulfate and bichromate baths. Although the Calcochrome Red ECB does not decompose, it does give poor color value when dyed metachrome in the presence of ammonium sulfate and bichromate. This is due in part to the rapid chromation of this dye in the dye bath. Using the data shown in Figure 13, the degree of chromation at various times (*12, 6*) has been calculated. The calculations show that the chromation of Calcochrome Red ECB is complete in approximately 30 minutes. Consequently, with the heating-up times used in the metachrome procedure, this dye is practically chromed by the time the bath reaches the boil. The chrome complexes of these dyes, when formed in the bath, either dyed with poor fiber levelness or exhausted very poorly. Therefore, methods which retard the chromation of dye in the dye bath until the dye is exhausted on the fiber are very desirable, since it is known that chromation of these dyes, after their absorption by the wool, produces the most desirable commercial results.

Dyeing Assistants

Although the color values of dyeings made by starting the dye bath at a pH of 8-9, using magnesium sulfate and reduced amounts of postassium bichromate, were much improved, compared with those of dyeings made by the usual metachrome procedure, there was need for further improvement because the dyeings were slightly weaker in color value, not as a fiber-level, and dyed more tippy than top chrome dyeings.

TABLE I

CALCOCHROME BROWN PG (Pr. 4†)

Sample No.	Temperature (°F.)	Time at b.p.* (min.)	% Total Dye Remaining in Exhaust Liquor: Top Chrome	Bottom Chrome	Meta Chrome	Calcomet
1	120	—	91	88	93	96
2	150	—	87	88	93	96
3	170	—	79	81	91	91
4	190	—	68	78	83	70
5	212	—	62	76	70	60
6	212	15	48	57	49	47
7	212	30	42	35	35	35
8	212	45	37	28	28	25
9	212	55	25	7	11	18
10	212	65	22	5	8	11
11	212	75	15	2	5	8

* After 45 min. at b.p., 1% of bichromate was added when dyeing by the top chrome method, and 2% acetic acid (28%) when dyeing by all the other methods.
† Percentage chromation of dye in the metachrome and Calcomet baths was not determined with this dye because of complications in the spectrophotometric measurements.

TABLE II

CALCOCHROME BLUE BLACK ZF (Colour Index, No. 202)

Sample No.	Temperature (°F.)	Time at b.p.* (min.)	% Total Dye Remaining in Exhaust Liquor: Top Chrome	Bottom Chrome	Meta Chrome	Calcomet	% Chromation of Dye in Liquor: Meta Chrome	Calcomet
1	120	—	86	45	74	100	21	2
2	150	—	37	42	70	77	70	10
3	170	—	14	38	65	73	86	18
4	190	—	11	35	60	53	93	38
5	212	—	9	32	63	36	97	62
6	212	15	5	30	52	19	98	93
7	212	30	4	25	50	17	100	100
8	212	45	4	26	42	8	100	100
9	212	55	3	21	47	9	100	100
10	212	65	2	17	38	7	100	100
11	212	75	2	4	30	5	100	100

* After 45 min. at b.p., 1% of bichromate was added when dyeing by the top chrome method, and 2% of acetic acid (28%) when dyeing by all the other methods.

TABLE III

CALCOCHROME BLUE BLACK CONC. (Colour Index, No. 202)

Sample No.	Temperature (°F.)	Time at b.p.* (min.)	% Total Dye Remaining in Exhaust Liquor: Top Chrome	Bottom Chrome	Meta Chrome	Calcomet	% Chromation of Dye in Liquor: Meta Chrome	Calcomet
1	120	—	74	85	88	91	13	0
2	150	—	55	66	63	70	42	10
3	170	—	25	53	56	60	56	14
4	190	—	20	40	47	40	72	26
5	212	—	21	33	41	18	88	50
6	212	15	14	20	35	5	93	60
7	212	30	13	7	31	3	97	73
8	212	45	13	5	27	3	100	88
9	212	55	3	4	26	2	100	90
10	212	65	2	3	25	2	100	95
11	212	75	2	2	24	2	100	96

* After 45 min. at b.p., 1% of bichromate was added when dyeing by the top chrome method, and 2% of acetic acid (28%) when dyeing by all the other methods.

Experiments carried out in the Calco laboratories with the commercially available acid and chrome dyes over the past ten years have shown that lack of fiber levelness could be minimized by using properly synthesized surface-active agents. These agents reduce the surface affinity of the wool for dye, regardless of the physical or chemical conditions of the fibers. These agents also speed up the exhaustion and aid especially in causing the chrome-dye complex, which may be formed in the solution, to dye the wool.

The effect of introducing a properly synthesized surface active agent, such as Calcomet Salt, to improve color value is shown in Figures 10 and 11, curve 6. It can be seen that the combination of the Calcomet Salt with magnesium sulfate and ammonia gave the best color values.

Calcomet Process

As the result of these studies and observations, the Calcomet Process was developed and was first introduced to the trade in June, 1944 (24). It is based on the use of the proper quantity of bichro-

TABLE IV

CALCOCHROME BROWN EB (Pr. 14)

Sample No.	Temperature (°F.)	Time at b.p.* (min.)	% Total Dye Remaining in Exhaust Liquor: Top Chrome	Bottom Chrome	Meta Chrome	Calcomet	% Chromation of Dye in Liquor: Meta Chrome	Calcomet
1	120	—	83	85	96	92	3	10
2	150	—	81	79	86	82	10	12
3	170	—	73	76	86	75	15	20
4	190	—	57	59	76	52	33	44
5	212	—	41	60	61	43	64	66
6	212	15	42	45	50	26	78	80
7	212	30	34	32	45	16	86	4100
8	212	45	38	24	41	11	94	100
9	212	55	33	11	30	9	98	100
10	212	65	25	15	24	5	100	100
11	212	75	21	11	26	6	100	100

* After 45 min. at b.p., 1% of bichromate was added when dyeing by the top chrome method, and 2% of acetic acid (28%) when dyeing by all the other methods.

TABLE V

CALCOCHROME BROWN RV (Pr. 2)

Sample No.	Temperature (°F.)	Time at b.p.* (min.)	% Total Dye Remaining in Exhaust Liquor: Top Chrome	Bottom Chrome	Meta Chrome	Calcomet	% Chromation of Dye in Liquor: Meta Chrome	Calcomet
1	120	—	80	84	100	96	2	0
2	150	—	75	82	95	94	4	1
3	170	—	55	76	83	85	10	3
4	190	—	50	65	80	80	20	10
5	212	—	37	60	64	66	52	27
6	212	15	37	34	47	44	83	44
7	212	30	38	15	39	32	100	73
8	212	45	35	9	24	17	100	85
9	212	55	37	1	12	7	100	96
10	212	65	26	1	4	4	100	100
11	212	75	24	1	2	3	100	100

* After 45 min. at b.p., 1% of bichromate was added when dyeing by the top chrome method, and 2% of acetic acid (28%) when dyeing by all the other methods.

TABLE VI

CALCOCHROME VIOLET B (Colour Index, No. 169)

Sample No.	Temperature (°F.)	Time at b.p.* (min.)	% Total Dye Remaining in Exhaust Liquor: Top Chrome	Bottom Chrome	Meta Chrome	Calcomet	% Chromation of Dye in Liquor: Meta Chrome	Calcomet
1	120	—	79	84	88	95	0	0
2	150	—	57	68	85	90	20	0
3	170	—	40	69	68	85	53	4
4	190	—	36	50	54	73	90	30
5	212	—	34	44	49	50	100	75
6	212	15	33	27	44	41	100	100
7	212	30	33	16	41	33	100	100
8	212	45	31	9	35	21	100	100
9	212	55	19	5	26	11	100	100
10	212	65	13	3	18	8	100	100
11	212	75	7	2	11	4	100	100

* After 45 min. at b.p., 1% of bichromate was added when dyeing by the top chrome method, and 2% of acetic acid (28%) when dyeing by all the other methods.

mate; the presence of magnesium sulfate; the proper control of pH., i.e., starting alkaline with ammonia and gradually lowering the pH; and the use of Calcomet Salt. Practically all the available chrome dyes can be dyed by this process to give color values, shades, and fastness properties equal to those obtained by the top or bottom chrome methods.

The mechanism of the Calcomet Process is based on dyeing under conditions which prevent the decomposition and the chromation of the dye in the bath. By starting the dyeing alkaline with ammonia and in the presence of magnesium, a magnesium dye complex appears to be formed. The formation of this complex delays the chromation and allows the unchromed dye to exhaust onto the wool. On boiling, the bath, due to the reaction of the wool and the loss of ammonia, will gradually decrease in pH (see Figure 7). This condition favors the formation of the chrome complex of the dye which, however, by this time is mostly exhausted onto the wool. In practical plant dyeings this change of pH on boiling may be so slow especially in closed systems, that careful additions of acid or acid salts may be necessary. The presence of the dyeing assistant in the bath speeds up, under alkaline conditions, the rate of exhaustion of the unchromed dye, causes the dye to distribute itself uniformly in all the wool fibers and, if any chrome dye complex is formed in the bath, aids in its uniform penetration into the wool.

The effectiveness of the Calcomet Process is shown in Color Plate Figures 13 to 24 using Calcochrome Blue Black Conc., Calcochrome Red ECB and Calcochrome Yellow CGW, as illustrative dyes. The first is a dye which previously has not been used for metachrome dyeing; the second has been used, but tends to give poor color value; the third is considered a satisfactory metachrome dye and is a typical example of those dyes which show only slight improvement when applied by the Calcomet Process. Another well accepted metachrome dye, such as Calcochrome Brown EB (Pr. 14) would have been shown in the Color Plate if space had permitted. Such a dye shows improvement in fiber levelness and color value approximately equivalent to that shown by Calcochrome Red ECB.

It is evident from the colored photographs of the dyed skeins that the Calcomet Process has produced a marked increase in color value of the Calcochrome Blue Black Conc. and the Calcochrome Red ECB. In the case of the Calcochrome Yellow CGW there was only slight improvement in color value.

A comparison of the cross-sections in the Color Plate of the final dyeings obtained with each dye employing the ordinary metachrome, the Calcomet and the standard top chrome processes, respectively, show how well the Calcomet Process simulates the top chrome process in fiber levelness. The Calcochrome Blue Black Conc. and Calcochrome Red ECB when dyed by the metachrome process are both poor in this respect, the former more so than the latter. The metachrome dyeing of Calcochrome Yellow CGW shows it to be fiber-level and illustrates why it is considered to be a good metachrome dye.

Comparison of Chrome Dyeing Methods

In order to compare the four methods of dyeing, laboratory experiments were carried out using similar time-temperature conditions (16), with 7 Calcochrome dyes exhibiting a wide range of dyeing characteristics. Dyed skeins were removed at definite time intervals and spectrophotometric measurements were made on each dyeing and on the dye bath from

TABLE VII

CALCOCHROME RED ECB (Colour Index, No. 652)

Sample No.	Temperature (°F.)	Time (min.) at b.p.*	pH Value of Dye Liquor: Top Chrome	Bottom Chrome	Meta Chrome	Calcomet	Calcomet without Calcomet Salt
Original	—	—	5.5	6.3	6.2	8.8	8.6
1	120	—	5.4	6.6	6.5	8.0	8.0
2	150	—	5.2	6.7	6.5	7.9	7.9
3	170	—	5.6	6.8	6.8	7.9	7.8
4	190	—	5.7	6.8	6.9	7.8	7.8
5	212	—	5.7	6.7	6.9	7.7	7.7
6	212	15	5.7	6.3	6.9	7.3	7.4
7	212	30	5.7	6.1	6.5	6.8	6.5
8	212	45	5.7	6.0	6.3	6.1	6.2
9	212	55	5.8	5.6	5.2	5.6	5.5
10	212	65	6.0	5.6	5.2	5.7	5.7
11	212	75	6.0	5.6	5.2	5.8	5.7

* After 45 min. at b.p., 1% of bichromate was added when dyeing by the top chrome method, and 2% of acetic acid (28%) when dyeing by all the other methods.

which each was removed using a modified General Electric type spectrophotometer. From the spectrophotometric curves obtained the color value and degree of chromation were calculated (6, 12). The experiments presented in this section were made in open dye pots which were raised to the boil in a water bath and then boiled in a calcium chloride bath. The skeins were turned by hand. Every attempt was made to control the time and temperatures of the dyeings as well as possible. Nevertheless, the results show some randomness which is due to a number of factors. One such factor is the instability of some dye solutions, while another is that certain dyes form precipitates. Consequently, the values for the degree of chromation are subject to error. Therefore, these data should not be considered to be perfectly reproducible, but they are comparable and several interesting observations have been derived from them.

Application Procedures

Bottom Chrome—Use 2.5% sodium bichromate and 2.0% cream of tartar, raise slowly to the boil and boil for 1½ hour. Rinse well. Bring the dyebath to 120°F. (50°C.) and add 2% dye and 4% ammonium acetate. Bring to the boil in 1 hour and boil for 45 minutes. Then add 2% acetic acid (28%) and boil for a further 30 min.

Top Chrome—Use 2% dye, 10% calcined Glauber's salt and 3% acetic acid (28%). Commence dyeing at 100°F. (38°C.), raise to the boil in 1 hour and

TABLE VIII

CALCOCHROME RED ECB

Sample No.	Temperature (°F.)	Time at b.p.* (min.)	% Dye Remaining in Exhaust Liquor: Top Chrome	Bottom Chrome	Meta Chrome	Calcomet	Calcomet without Calcomet Salt	% Chromation of Dye in Liquor: Top Chrome	Bottom Chrome	Meta Chrome	Calcomet	Calcomet without Calcomet Salt
1	120	—	75	87	91	91	93	0	0	10	—	3
2	150	—	60	83	87	81	81	0	0	30	3	10
3	170	—	36	71	80	65	69	0	0	64	18	34
4	190	—	27	56	74	47	59	0	3	93	46	52
5	212	—	23	50	70	31	50	0	6	100	81	92
6	212	15	21	26	55	13	39	0	13	100	95	100
7	212	30	18	17	40	4	21	0	48	100	98	100
8	212	45	16	8	24	3	8	0	52	100	98	100
9	212	55	9	5	15	2	5	95	65	100	98	100
10	212	65	5	3	4	2	4	100	76	100	98	100
11	212	75	3	3	3	2	2	100	80	100	100	100

* After 45 min. at b.p., 1% of bichromate was added when dyeing by the top chrome method, and 2% of acetic acid (28%) when dyeing by all the other methods.

TABLE IX

CALCOCHROME RED ECB

Sample No.	Temperature (°F.)	Time at b.p.* (min.)	% Strength of Dyeings: Top Chrome	Bottom Chrome	Meta Chrome	Calcomet	Calcomet without Calcomet Salt	% Chromation of Dye on Wool: Top Chrome	Bottom Chrome	Meta Chrome	Calcomet	Calcomet without Calcomet Salt
1	120	—	17	14	9	7	5	0	—	—	—	—
2	150	—	63	27	22	28	13	0	—	—	—	—
3	170	—	115	53	36	48	28	0	20	26	20	25
4	190	—	150	75	42	68	36	0	34	64	55	53
5	212	—	145	81	43	96	58	0	48	93	92	93
6	212	15	135	117	57	107	70	0	88	100	100	100
7	212	30	100	135	73	116	87	0	95	100	100	100
8	212	45	100†	145	80	107	88	0	100	100	100	100
9	212	55	96	145	82	125	92	85	100	100	100	100
10	212	65	100	175	87	112	100	100	100	100	100	100
11	212	75	100	175	91	125	100	100‡	100	100	100	100

* After 45 min. at b.p., 1% of bichromate was added when dyeing by the top chrome method, and 2% of acetic acid (28%) when dyeing by all the other methods.

† Standard for strength.

‡ Standard for chromation.

boil for 45 minutes. Then add 1% sodium bichromate and boil for a further 30 min.

Metachrome—Use 2% dye, 10% ammonium sulfate, 1% sodium bichromate and 2% acetic acid (28%). Raise to the boil in 1 hour and boil for 45 minutes. Then add 2% acetic acid (28%) and boil for a further 30 minutes.

Calcomet Method—Use 2% dye, 2% ammonia (sp. gr. 0.90), 4% magnesium sulfate (Epsom salt), 0.7% sodium bichromate, 2.0% Calcomet Salt and 4.0% ammonium acetate. Raise to the boil in 1 hour and boil for 45 minutes. Then add 0.5-2.0% acetic acid (28%) and boil for a further 30 minutes. In practice, it may be necessary to add an additional 0.3% sodium bichromate towards the end of the dyeing and boil for an additional 30 minutes. This final step may be necessary to insure maximum fastness properties on commercial dyeings.

The data for a number of dyes are given in Tables I to VI and represent the percentage of the total dye remaining in each dye bath at different times during the dyeing process using the top, bottom, metachrome and Calcomet procedures described above. In the case of the Calcomet and the meta chrome procedures, the percent of dye which has been chromed in the dye bath was also determined. In order to emphasize the difference between the various chrome dyeing processes, Calcochrome Red ECB was selected because exploratory experiments had shown that this dye was sensitive to change and its dyeing registered slight variations in the methods of application. The detailed data for this dye are given in Tables VII to IX.

Discussion of Data

Although each dye shows its own individual characteristics with respect to manner of exhaustion and chromation, there are some general trends which may be pointed out. One of these is that, of the various chrome processes, the Calcomet method uniformly gives a more rapid rate of exhaustion. Another is that both the Calcomet and bottom chrome procedures give nearly complete exhaustion. Further, it can be seen that the amount of chromation of dye in the dye bath tends to be greater in the meta chrome process, and the rate at which this chromation takes place is definitely more rapid.

The more detailed comparison of the various chrome dyeing processes as shown by the data obtained with Calcochrome Red ECB given in Tables VII, VIII and IX brings out several interesting contrasts in pH, exhaustion, chromation, and color development. Considering pH first, all of the processes, except the Calcomet, start on the acid side of pH 7. The bottom, meta, and top chrome methods show very little change up to 45 minutes at the boil, i.e., the point at which acid was added to the meta and the bottom chrome methods and only chrome was added to the top chrome method. After this time the top chrome dye bath became slightly less acid while the other dye baths became more acid. The Calcomet process, with or without Calcomet Salt, differs from all the other chrome processes in that it starts definitely on the alkaline side and only after a considerable period of boiling does it become acid. This is in accordance with the previous discussion of inducing an effective control of exhaustion and chromation.

With regard to exhaustion, the top chrome method has the highest rate in the early stages of dyeing, while the meta chrome method has the lowest. The exhaustion rates of the bottom chrome method and the Calcomet method without the Calcomet Salt are intermediate and approximately equivalent. When Calcomet Salt is present the rate of exhaustion is increased, even though, as mentioned above, the bath is alkaline. This fact, it is believed, is due to the sorption by the wool of the Calcomet Salt, which in turn increases the dye sorption and fixation.

The poor exhaustion of the meta chrome process in the early stages is due to the slow removal of the chrome complex which is formed in the bath. Thus, examining the data on percentage chromation and percentage dye remaining in the bath, it is seen that, when the bath reaches the boil in the meta chrome process, the 70% dye remaining in the dye bath is completely chromed. As emphasized earlier the chromium-dye complex dyes very fiber-unlevel and, therefore, even though final exhaustion with the meta chrome method may be as complete as that of the Calcomet method, the color value and solidity of shade of the final dyeings are inferior. Likewise, a comparison of the Calcomet process with and without Calcomet Salt, shows that at the boil the former has only 25% while the latter has 46% chromed dye in the bath. A low value of chromed dye in the bath is a desirable characteristic found in the top and bottom chrome processes. This improvement obtained when Calcomet Salt is introduced in the Calcomet process is such as to make the use of this ingredient an important factor.

Although the final exhaustion of the dye from the baths by the various methods was substantially the same, the color values of the final dyeings exhibit a wide variation. With this particular dye the bottom chrome method gave the highest value, possibly due to the protection afforded to the dye by the reduced chrome in the wool. Chromium as bichromate is known to affect the color value of this dye when top chroming is prolonged. The increased color value of the Calcomet method over the other methods is due largely to the better fiber levelness.

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22. Goodall, F. L., and Hobday, C., J. Soc. Dyers Colourists, *58* 36 (1942).
23. Race, E., Rowe, F. M., and Speakman, J. B., J. Soc. Dyers Colourists, *62* 372 (1946).
24. Calco Technical Bulletin No. 765, June, 1944.

—♦ ♦—

• For Business Men Visiting Britain

Facilities for the overseas business man visiting London are offered by International Business Services at their recently-opened headquarters in Arlington Street, Piccadilly. The subscriber can have mail, packages, cables, telephone calls and personal cables received on his behalf and dealt with according to his instructions. In his absence, mail is held for collection or forwarded. There is an information bureau ready to answer queries and to assist in dealing with trade problems.

A reference library contains up-to-date trade manuals, directories, time-tables, maps, magazines, newspapers, and facilities for writing memoranda. Trained stenographers are available.

A conference room can be booked in advance for business meetings.

• PATENT DIGEST •

PAUL WENGRAF

Flameproofing — Melamine — Phosphoric acid Treatment
G, 2, 03

U. S. Pat. 2,418,525
(Fred. F. Pollak, April 8, 1947, application, Sept. 29, 1942)

The present invention deals with a process for rendering textiles flame-resistant and, moreover, for preserving this quality during some washing operations. It is stated in this specification's introduction that many attempts have been made for obtaining a combination of flameproofing quality with water resistance but that neither organic nor inorganic compounds have been satisfactory in this respect. The inventor has observed that melamine forms insoluble salts with phosphoric acids and particularly with pyrophosphoric acid in a heat treatment. An insoluble white precipitate is formed, strongly adhering to the fibers, which precipitate can only be removed by a washing process. This impregnation does not make the fibers brittle as it occurred in some older processes. The phosphoric acid has the property of swelling the fibers and *making them substantive* for the absorption of malomine by the fiber substance. However this melamine-pyrophosphate complex shows a certain sensitivity to alkalies, salts and some acids. In order to overcome this drawback the fabric has to be pretreated or aftertreated with a urea or thiourea condensate. In an example 76 p.b.w. of thiourea are dissolved in 112.5 p.b. vol. of neutral formaldehyde at 40° C. When the reaction is over and no smell of formaldehyde is perceptible 190 p.b.w. water and 30 p.b.w. of melamine are added. A fabric is impregnated with a 5% pyrophosphoric acid solution, squeezed out and passed through the melamine solution as described above. The dried goods are baked at 120-140° C. This flameproofing finish is water and soap resistant.

References cited by the Pat. Off. are amongst others:

U. S. Pat. 1,924,181 (Cutler): quite generally waterproofing finishes on the base of resins.

U. S. Pat. 2,368,451, 1945 (Gen. Elect.) discloses that the proper melamine-formaldehyde resins can amongst other applications also be used as fire retardants.

Brit. P. 501,514, 1939 (Amer. Reenforced Paper Co.): paper treated with resins, later on insolubilized for decreasing the shrinkability.

Other references are for example:

U. S. Pat. 2,411,396-7 (Am. Cyanamid) —*issued Nov. 1946*— sodium cyanamide plus formaldehyde giving flameproofing finishes.

U. S. Pat. 2,305,035 (Sylvania): alkylolamine guanidine phosphates as flameproofing agents.

Brit. P. 575,903 (Brit. Celanese): diammonium methyl phosphates plus urea, etc.

It can be seen by the present specification that the phosphoric acid has here several functions: to make the fibers substantive to a further impregnation with melamine, to combine with melamine to an insoluble precipitate and probably to act at the same time as a curing agent for the second impregnation with the urea-or thiourea- formaldehyde resin and finally to bring about the fire-retardant effect.

Indigosols — Printing — Oxidation catalyst
D, 2, 04

Brit. P. 583,115
(Soc. Chem. Ind. Basle, December 10, 1946; application, June 24, 1943; Swiss Prior, June 24, 1942)

In printing the Indigosol Dyestuffs (leucoester-salts of vat dyestuffs) it is necessary to add an oxidation catalyst when the steam developing (ageing) method is used. Generally ammonium vanadate is applied. Certain textile goods, however, for instance spun rayon, give poor results when printed with an ammonium vanadate containing paste. Probably the development of the dyestuff in the ager proceeds so fast that this special fiber cannot absorb the dyestuff solution in the short ageing time. Additions of solutions of sodium ferrocyanide or nitroprusside or other metal catalysts (manganese, cobalt, etc. salts) acting slower than ammonium vanadate gave much better results.

References: Brit. P. 426,073 (Durand-Huguenin) proposes to counteract a too fast oxidation, which is dangerous for the dyestuff yield, by adding stannous salts or Ti Cl₃ which act as buffers so that the dyestuff is first oxidized and that one of the here mentioned salts takes up the surplus oxygen only. The same company proposed (U. S. Pat. 1,917,101) to add cupric salts as oxidizing catalysts. Copperferrocyanide has been used as a catalyst in oxidizing and precipitating the dyestuff on the printed areas (compare Brit. P. 393,381—Bleacher's Assoc.)

Indigosol Printing — Quaternary compounds as solubilizing agents
D, 2, 04

Brit. P. 583,413
(Durand Huguenin, Dec. 18, 1946; application, May 5, 1942; Swiss Prior. May 5, 1941)

Many of the Indigosols having very valuable properties are difficultly dispersible in printing pastes because they are sensitive to the other electrolytes contained in the printing paste and thereby readily salted out. Mostly these pastes stick in the engraved copper roller portions and become useless for printing. It has been found that some Indigosols which are otherwise very difficult to handle become very soluble by adding quaternary ammonium compounds. The simplest example for such a quaternary compound is the reaction product of an ethanolamine ether (such as the tri-hydroxylether of triethanolamine) with an alkylating agent. Level bright prints are obtained in this way.

References: Triethanolamine or polyamines are added to Indigosol prints according to U. S. Pat. 2,389,245 (Sandoz, Wiazmitinow) in order to increase the stability of the paste and to avoid premature decomposition. The present patent corresponds to U. S. Pat. 2,372,370.

Shrinkproofing Cellulosic Textiles — Alkylated Melamine Condensates
G, 2, 04

Brit. P. 583,428
(Imp. Chem. Ind., Evans, Rogers, Dec. 18, 1946; application, Jan. 26, 1945)

Shrinkproofing cellulosic textiles is carried out by impregnating the fabrics with a solution, containing 10% b.w. of an etherified melamine-formaldehyde precondensate, to which diphosphate and excess formaldehyde are added. The fabrics are dried and baked as usual. At least one hydrogen of the precondensate has to be still available for further condensation, and formaldehyde has to be present in at least a third of the weight of the condensate.

References: Shrinkproofing with methylated methylolmelamines is described in U. S. Pat. 2,339,203 (Am. Cyanamid) probably covering the "Lanaset" process. See also the report in AMERICAN DYESTUFF REPORTER of April 23, 1945 p. P167 by Alden D. Nute. Other shrinkproofing melamine condensates are known under the tradenames "Resloom" (Monsanto Chem. Co.) and "Monomel", both mentioned in *Rayon Textile Monthly* of June 1944, p. 37.

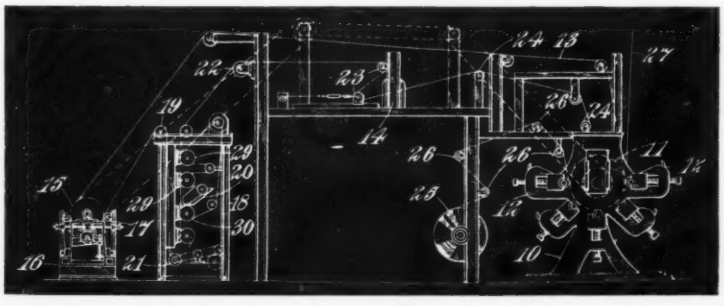
Printing Machine — Applying powder to the Printing Blanket D, 3

Brit. P. 583,647
(Dewey & Almy Chem. Co., Dec. 23, 1946; application, Nov. 13, 1944; U. S. Prior, September 12, 1944)

The printing machine, described in this patent, belongs to the type of devices where the fabric to be printed runs directly on a waterproofed blanket while the usual back-grays are omitted. This elimination of the back-grays is highly desirable but nevertheless there are some difficulties in this method because the colors, spreading from the printed fabric to the blanket cannot readily be removed by a simple washing operation, particularly when colors, having a water-immiscible vehicle (thus principally lacquer prints or pastes of the "Aridye" type) are used. Complete cleaning of the blanket after the printing operation and before re-entering the printing machine might require a considerable time, therefore a washing box of great length. It has been discovered according to the present invention that textile colors carried away by the blanket may be dispersed more rapidly and better removed if a layer of particles of fine powder is applied to the blanket before it is conveyed to the printing rolls. It can be realized that these fine layers of insoluble powder mix with the remainders of printing paste which are spread either sidewise on the blanket or penetrated through the fabric. The invention can best be understood in connection with the accompanying drawing: a conventional printing machine (10) is fitted with an impervious blanket (13), passing around the printing cylinders and carried over roller (15) to the washing machine (16). Washing machine (16) is provided with water sprays and brushes so that the blanket can be thoroughly cleaned after leaving this apparatus. Thereupon the blanket is led immediately through a powdering apparatus (18) over rolls (19) and (21). A supply chute (20) covers the blanket regularly with a fine mineral powder, which may consist of infusorial earth, talc powder, Bentonite, starch or gum. Obviously the excess printing paste is much better carried away in the subsequent washing process (when the blanket returns after printing to the washer) when mixed with the insoluble vehicle: a thick slurry is formed which is quite analogous to removing oily dirt or the like by mixing it first with sawdust. A great advantage results thereby that the blanket has not to pass over any heating device. The only heat carried away by the blanket comes from the warm water in the washing machine or from the mechanical working of the blanket during the printing operation. No danger of a local overheating of the printing paste is imminent. The specification mentions also that indentations should be provided on the surface of the blankets. In this event the brushes (29) force the powder into all depressions so that the blanket carries some powder in the indentations.

Reference is made to the abstract concerning the Company's Canad. Pat. 437,322 in AMERICAN DYESTUFF REPORTER 1947, p. 155 giving a report on some earlier work done in this field.

Printing Machine—B.P. 583,647



Acetate of Cellulose — Complete Saponification of Fibers C, 4, 07

Brit. P. 580,433
(British Celanese, September 6, 1946; application, July 14, 1944, U. S. Prior, July 15, 1943)

Brit. P. 581,947
(Brit. Celanese, Oct. 30, 1946; application, April 18, 1944, U. S. Prior, April 30, 1943)

Saponification of fabrics, consisting completely or to an essential part of acetate of cellulose, is mostly carried out in order to give the fibers affinity to direct water soluble cotton dyestuffs. It is known however that strongly alkaline conditions, necessary for completely saponifying the fibers very often cause an undesirable loss of breaking strength. It has been proposed (Brit. Pat. 453,302 of the same company) to use salts for repressing the swelling action of the alkali. A further improvement has now been found in adding aldehydes in small concentrations to the saponifying bath. An example is given: a saponifying liquid is composed from 0.6% sodium hydroxide (therefore a relatively small amount of caustic alkali), 3% of formaldehyde and 25% sodium sulfate. The skeins or fabrics are heated to 80° C. and kept in this bath for 90 minutes. The second patent (581,947) protects also a complete saponifying process, using 0.6—1% NaOH and a saturated salt solution (for instance sodium sulfate).

References: The late Harold de Witt Smith published in AMERICAN DYESTUFF REPORTER, on February 11, 1946 p. P 71 and in *Rayon Text. Monthly* of February 1946 p. 72-78 remarkable data, concerning the properties of completely saponified yarns. Although many textile experts still believe in recent times that saponification of acetate rayon necessarily resulted in severe damage of the fibers, continued research carried out by Celanese (see U. S. Pat. 2,346,759, 1944 and 2,366,241, 1945) proved that acetate threads of increased strength could be obtained by a combined stretching and saponifying process and that a fast passage through highly concentrated alkalies *preserved moreover* the affinity of the fiber to typical acetate dyestuffs while otherwise saponification has the effect of decreasing or destroying completely the affinity to this type of dyestuffs. U. S. Pat. 2,378,183 (Eastman Kodak) proposed to produce highly resistant ester-cellulose yarns by incorporating phenol aldehyde condensates.

Cross Reference: Cellulose Acetate — complete saponification F, 2, 03

Brit. Patents 580,433, and 581,947
(Brit. Celanese)
See Report in *C, 4, 07.*

Corrections

Page 338, June 16 issue, Protein Condensates as Flameproofing Agents, index number should be G, 2, 03 instead of C, 2, 03.

Page 396, July 14 issue, Water Repelling Finishes — Alkylolstearamide — glycollic acid ether, equation should read:

$$C_{17}H_{35}CONH.CH_2OH + CH_2CHOH\text{–}COOH \rightarrow C_{17}H_{35}CONHCH_2O\text{–}CH_2CH_2COOH + H_2O$$

BOOK REVIEWS

Bibliography of the Technical Literature on Silk

By F. O. Howitth, Ph. D., F.R.I.C., F.T.I. (British Cotton Industry Research Association Silk Section). Published by Hutchinson's Scientific and Technical Publications, 1947. 248 pages. Price 21 shillings.

It is often said that silk is the most fascinating of all the textile fibers. Silk has been used by man as a textile material for more than 5,000 years, and even today in spite of the advent of the cellulosic rayons, and other synthetic fibers, its beauty of texture and unique tensile properties are still universally appreciated.

Even though the use of silk throughout the world has been greatly curtailed during the past few years on account of the war, it is already staging a comeback which will undoubtedly increase as time goes on.

This book is not merely a Bibliography, because the bibliographical list of references is accompanied, by a continuous expansion and commentary on the fundamental facts covered and presents a comprehensive review of the whole subject. It also gives a list of 22 publications on the subject of silk, and a very complete Glossary of Silk Terms. In fact it is one of the most complete and useful bibliographies we have seen.

The author states in his introduction, that when he became head of the Silk Section of the British Cotton Industry, his greatest need was a comprehensive survey of all that had been published in regard to silk and the silk industry in its technological and scientific aspects. No such survey being available, during the past ten years he has made a review of all the published literature that was accessible, either in the original, or as abstracts. The review was completed in 1945.

The author has done an extremely commendable job and furnished us with a guide to the published literature dealing with silk in respect to the technical processing and to the scientific aspects of silk from both the practical and fundamental points of view. This book should be in every textile library.

Portland Cement Technology

By J. C. Witt, M.E., Ph. D., Technical Director, Marquette Cement Manufacturing Co. 241 pages, 37 figures. Published by Chemical Publishing Co. Inc., Brooklyn, N. Y. Price $10.00.

Most industries use cement to a greater or less extent and the textile industry is no exception. This book should therefore be of interest to the Textile Engineer and Chemist. About one half of the book is devoted to the origin, methods of manufacture, and the chemical and physical nature of cement, and the remainder to analyses and tests, and its uses.

The book is based on the author's years of experience in many phases of the technology of Portland cement and other materials of construction, prospecting for raw materials, plant operation, engineering, research, and administration and is authoritative. There is an excellent bibliography and much general information of value to engineers.

The Standard Handbook of Textiles

By A. J. Hall, B. Sc., F.R.I.C., F.T.I. Consulting Chemist to the Textile and Allied Industries. 296 pages, 228 illustrations. Published by D. Van Nostrand Co. Inc. 1946. Price $5.00.

The author who is well known in England for his numerous publications along textile chemical lines, presents this book as a more general treatise on the textile fibers, their conversion into fabrics, and their processing. Originating as an English book the 228 illustrations are naturally of British equipment and machines, but they do not differ materially from those of American make as far as principles involved.

The book is of general interest to textile chemists, dyers and finishers, although the author may have attempted to cover too much ground in too few pages.

The Chemistry and Physics of Organic Pigments

By Lyde S. Pratt, Ph. D. Technical Consultant, Organic Pigment Department, Calco Chemical Division of the American Cyanamid Co. 359 pages, 103 figures. Published by John Wiley and Sons, New York City. 1947. Price $6.00.

A thorough, authentic and critical treatment of organic pigment colors for all scientists and technologists concerned with coloring agents and their uses. Testing and identification methods for an exhaustive list of pigments are presented.

The author has covered a rather broad background of the history, and theoretical considerations of the relation between color and chemical and physical structure of the raw materials for synthetic organic pigments and the chemistry involved in the formation of colored products.

In a special chapter, emphasis is placed on a new interpretation of the significance of physical structure as related to color as a factor not ordinarily recognized and undoubtedly of little importance in the field of dyestuffs, except for certain vat dyes, but of fundamental importance in the field of organic pigments. Use of pigments in the fields of paints, varnishes, lacquers, enamels, printing inks, carbon papers, typewriter ribbons, rubber, linoleum, natural and artificial leathers, paper wax, plastics, synthetic and natural resins, paper coatings, textile printing and dyeing, ceramics, cements are all discussed. The use of photo-micrographs, and color curve analysis is well covered.

Those actively engaged in almost any phase of the many color producing or consuming industries should be interested in this book, which in addition to dealing exhaustively with the chemical and physical background of organic pigments, including testing and identification methods, places special emphasis on the opportunities for original research afforded by careful study of physical properties and condition during preparation.

The New Fibers

By Joseph V. Sherman, Associate of Herbert R. Simonds, Consulting Engineer, and Signe Lidfeldt Sherman, M.S., Fellow of the American Institute of Chemists, Inc. and formerly Research Chemist, Eastman Kodak Co. 538 pages, 80 figures, many tables. Published by D. Van Nostrand Co. Price $5.00.

This book gives an excellent summary of information both scientific and popular regarding the new fibers that are making their way from the headlines into every day living. The story of nylon, Vinyon, Fiberglas, Saran, Velon, Aralac, Ardil and others from their history and development through their manufacture and processing is well covered with a discussion of their properties and applications.

Newer developments with the rayons such as high-tenacity viscose rayons and Fortisan are described and their uses in tire manufacture with other applications.

A very complete patent section, 141 pages, is included. The book gives many facts regarding both the man-made fibers and the chemically improved natural fibers, and describes the research efforts being carried on to develop both of these groups.

Protective Organic Coatings As Engineering Materials

The 1946 A.S.T.M. Edgar Marburg Lecture, by Joseph J. Mattiello, Vice-President and Technical Director, Hilo Varnish Corp. 100 pages. A.S.T.M. Headquarters, 1916 Race St., Philadelphia 3, Pa., $1.50 per copy.

Dr. Mattiello points out that manufacture of protective organic coatings is emerging as an industrial science and that the industry is a chemical and engineering industry. He indicates that the coatings essentially are used for one or more of these main purposes; for decoration, for the protection of structural and technical materials, for sanitation, and for obtaining better distribution of light or greater illumination of objects.

This extensive lecture covers raw materials, oils, resins, pigments, etc., and various finished products including paints, enamels, and varnishes and their is extensive treatment of the uses of coatings in a wide variety of fields including electrical insulation, luminescent coatings, marine paints, hot plastic paint, structural steel painting, textile and fabric coatings, transportation paints, etc. There is considerable material on the methods of evaluating and some indication of statistical and future trends. There is an extensive bibliography and a large number of figures and charts.

The Rayon and Synthetic Fiber Industry of Japan

By H. Wickliffe Rose of the American Viscose Corporation. 340 pages. Price $6.00 postpaid and may be secured from the Textile Research Institute Inc., 10 East 40th St., New York 16, N. Y.

Textiles employed half the industrial workers in Japan before the war. In spite of the fact that Japan had the largest silk production in the world a rayon industry was built, which, in 1938, the peak prewar year, produced nearly 30 per cent of the total world rayon output.

In January, 1946, a Textile Mission, sponsored by the United States Department of State, was sent to Japan for the purpose of learning what was Japan's productive capacity and what could be done to put that capacity to work in order that the Japanese might provide at least their own minimum requirements and, if possible, to contribute also to the world textile needs.

To H. Wickliffe Rose of the American Viscose Corp. was assigned the task of making a detailed study of the rayon industry. In this work he was assisted by Dr. M. D. Parekh of New Delhi, India, a graduate of Massachusetts Institute of Technology in chemical engineering. Much information of a technical nature was obtained concerning manufacturing techniques, chemical processes, and new fibers as well as detail information on organization, production, costs, raw materials, research, and education.

In conducting this study visits were made to nearly all of the operable plants and some that were not. Personal interviews were held with prominent industrialists, heads of plants and their staffs, and with heads of manufacturing associations. The information thus gathered has been compiled by Mr. Rose into this report. In order that this important report be made available to business and industry, Textile Research Institute has, with the approval of the State Department, undertaken its printing and distribution.

Included in the report are flow sheets and machine drawings as well as numerous photographs. While it is true that Japan's rayon technology originated abroad, considerable originality is evident in certain directions. Emphasis was placed on integration and especially upon low-cost techniques. All major operations were mechanized. Some interesting new fibers were discovered about which nothing was previously known. The Japanese commercial development of polyvinyl alcohol appears to have been made possible by original invention in Japan.

TRADE NOTES NEW PRODUCTS

• Model Lixator at N. Carolina State

As part of his program to teach modern techniques of using salt in dye house operations, Professor A. H. Grimshaw, head of the Textile Chemistry and Dyeing Department of North Carolina State College, has installed a model-size Lixator at the college for laboratory demonstrations. Presented by the International Salt Company, Inc., the small Lixator will give students an opportunity to study it in operation and to observe the advantages which its use makes possible in textile mills.

Model Lixator

The model measures 12 inches in diameter and can dissolve 25 pounds of rock salt per hour. Commercial sizes of the Lixator range from 24 inches in diameter, which dissolve 100 pounds per hour, to 72 inches, which dissolve 1,000 pounds per hour. Large size salt storage type Lixators are also designed by International Salt Company, Inc., engineers. These may be made in various shapes and dissolve salt at the rate of many tons per hour.

• To Specialize in Flexible Plastic Coatings

As one of the first moves in combining the technical strengths of Interchemical Corporation, Finishes Division, and Roxalin Flexible Finishes, a new department has been created to specialize in flexible plastic coatings, J. G. Morris, division president announced today.

Chester M. Robbins

Michael A. Dorian

With Chester M. Robbins, formerly Vice President of the Textile Colors Di-

vision of Interchemical, as Sales Manager, the department will have as Service Manager Michael A. Dorian, previously Manager of Roxalin's Textile Finishes Department. With its own technical staff concentrating in this field, this new department offers the combined skill and experience of specialists in the coating and decoration of such sub-strata as paper, textiles, plastics, rubber, metal foils and leather.

Materials available for these uses include gravure inks of the solvent type for application on textile print machines, compounds for continuous film coating, flocking compositions and adhesives with other special purpose coatings to follow, as the weight of the technical background of this department makes itself felt.

Sales headquarters will be at the new Interchem Finishes location, 57-59 State Street, Newark 2, New Jersey.

• Symposium on Dyeing

The Society of Dyers and Colourists is to hold a symposium on recent advances in the theory and practice of dyeing on September 25th, 26th and 27th. It is anticipated that 14 or 15 papers will be presented during the three day session.

• New Carbide & Carbon Plant

A new plant has just been completed by Carbide and Carbon Chemicals Corporation at Texas City, Texas, for large-scale production of the industrially important ethylene amines. These organic bases — ethylenediamine, diethylenetriamine, triethylenetetramine, tetraethylenepentamine, and aminoethylethanolamine— are said to be finding ever-increasing demand in many industrial applications. A highly reactive nature makes them useful in the synthesis of ion exchange resins, rubber accelerators, dyestuffs, photographic developers, synthetic waxes and resins, pharmaceuticals, corrosion inhibitors, insecticides, and fungicides.

Aminoethylethanolamine, also known as hydroxyethyl ethylenediamine, finds its widest application in the production of textile finishing agents which are said improve the feel and appearance of cotton and rayon cloth.

• New pH Test Kit

A new pH Test Kit containing nineteen Hydrion pH Test Papers in eighteen plastic dispensors, all in one convenient case, has been announced by R. P. Cargille, 118 Liberty St., New York 6, N.Y. This complete assortment is said to cover the full range from pH 0.0 to pH 14.0, and distinct color changes can be obtained within 0.25 pH Unit of almost any point of interest on the pH scale. Eleven of these papers are now released for the first time. The complete assortment is listed as Hydrion Set H-20; the price is $20.00.

• Joins ITT

Dr. Monroe Couper, who has joined the staff of the Institute of Textile Technology in the Division of Organic Chemistry. Dr. Couper was with the DuPont Company for 6 years as research chemist where he was engaged in dye research problems, in particular the synthesis, application and fastness of dyes.

He is a member of the American Chemical Society, the American Association of Textile Chemists and Colorists and Sigma Xi.

• Information on Dye Production

Comprehensive information on the processes and machinery used by I. G. Farbenindustrie in the production of dyes and dyestuffs intermediates is contained in five British reports for sale by the Office of Technical Services, Department of Commerce. Complete with formulas, the reports describe German developments from 1935 to 1945.

The processes at each plant and the methods used for identification of dyestuffs, handled mainly at Leverkusen, are described in detail as follows:

PB-60905. (*German Dyestuffs and Dyestuffs Intermediates, Azo and Lake Dyestuffs;* microfilm, $4; photostat, $12; 178 pages) contains expense figures, descriptions and sketches of the Hoechst and Ludwigshafen plants; a list of principal and special azo and lake dyestuffs, with notes on research; information on the use of diamidediphenylmethane sulfone for detecting excess nitrous acid and color processes used at both plants.

PB-60885. (*German Dyestuffs and Dyestuffs Intermediates; Azoic Products, Including Naphthols, Fast Salts, Nitrosamines, and Rapid Fast Salts, Rapidogens;* microfilm, $1; photostat, $4; 46 pages) contains a brief introduction followed by 11 appendices describing the production and efficiency of naphthols, fast salts and nitrosamines; details of standardizing processes, and rapidogen sales in 1939.

PB-52881 (*Identification of Dyestuffs in I. G. Farbenindustrie;* microfilm, $1; photostat, $2) contains the results of an interview with Dr. Thomae on the identification of insoluble textile dyestuffs and vat dyes on fiber, and tables containing required data for identification of dyes.

PB-63858 (*I. G. Farbenindustrie; Manufacture of Triphenylmethane Dyestuffs and Intermediates at Ludwigshafen and Hoechst;* microfilm, $3; photostat, $7; 103 pages) lists the principal triphenylmethane dyestuffs and describes most of the manufacturing processes and also contains the details of auramine drying and the summaries of reports covering development work from 1935-1945.

PB-65657 (*German Dyestuffs and Dyestuffs Intermediates; Anthrasols, Heliogens, Sirius Light Blue Dyestuffs;* microfilm, $2; photostats, $7; 91 pages) lists the anthrasols (soluble vat dyestuffs) made at Hoechst and describes (in German) eight processes; gives process details for several types of heliogens produced at Ludwigshafen and Leverkusen and for sirius light blue dyestuffs (dioxazine) at Hoechst. A few flow diagrams and a sketch of the pyroxazine apparatus are included.

Orders for the reports should be addressed to the Office of Technical Services, Department of Commerce, Washington 25, D. C., and should be accompanied by check or money order, payable to the Treasurer of the United States.

Mimeographed copies of the first three reports (PB-60905; $9), (PB-60885; $4) and (PB-52881; $2) may also be purchased from Hobart Publishing Company, Box 4127, Chevy Chase Branch, Washington 15, D. C.

• Berkshire Appointments

Berkshire Color and Chemical Corporation, Springfield, Mass., announces the following appointments:

James E. Burns as Technical Sales Representative covering Rhode Island, Eastern Massachusetts, and Connecticut. Mr. Burns is a graduate of LaSalle Academy and Providence College. He was associated with his father at the Livingston Worsted Mills, Inc., Holyoke, Mass., for a number of years.

Charles R. Puliafico as Technical Director in charge of all development and control work. Mr. Puliafico is a graduate of Lowell Textile Institute with a Bachelor's Degree in Textile Chemistry. Prior to assuming his new duties, he was connected with the Cranston Print Works, Webster, Mass., as Assistant Chemist.

Julius Goldman as Office Manager and Purchasing Agent. Mr. Goldman is a graduate of the Bently School of Accounting and Finance, Boston, Mass. He was recently discharged from the Medical Branch of the U. S. Army after serving three years, two and one half of which were spent in the European Theater.

• New Sales Managers, Nuodex

Promotion of A. C. Mueller and J. W. Van Tuin to the newly created positions of Sales Managers of the Eastern and Western Divisions, respectively, of the Nuodex Products Co., Inc., Elizabeth F, New Jersey, has been announced by H. M. Johnson, Vice President in Charge of Sales.

The new sales administrative setup divides the country into two separate sections in order to improve service to customers in each area. It provides decentralized field sales headquarters for more efficient handling of all sales matters pertaining to customers or sales agents.

The Eastern Division, with offices in Elizabeth, consists of the North Atlantic Region and the North East Central Region which, combined, comprises New England, the Atlantic Seaboard States, as far south as South Carolina, as well as Pennsylvania, Ohio, West Virginia, Michigan and Kentucky. The Western Division, with offices in Chicago, includes the North Central Region, the Southern Region and the West Coast Region, which make up the remaining states. The two divisions are responsible for the activities of the following 29 Nuodex sales agency offices located throughout the country.

Eastern Division: Baker and Collinson, Detroit, Mich.; Brice H. Boyet, Louisville, Ky.; Homer D. Butts, Pittsburgh, Pa.; Commercial Chemicals, Inc., Buffalo, N. Y.; F. V. Gunn & Co., Inc., Richmond, Va.; W. B. Leslie Co., Cleveland, Ohio; D. H. Litter Co., Inc., New York, N. Y.; Boston, Mass., and Philadelphia, Pa., and B. H. Roettker Company, Cincinnati, Ohio.

Western Division: Abner Hood Chemical Co., Kansas City, Mo.; R. T. Hopkins, Atlanta, Ga.; Indiana Naval Stores, Indianapolis, Ind.; Mount & Alsop, Inc., Portland, Oregon; J. E. Niehaus and Company, St. Louis, Mo.; Post Brokerage Company, Nashville, Tenn.; Dorothy B. Smith, Seattle, Wash.; and Thompson-Hayward Chemical Co., Dallas, Texas; Davenport, Iowa; Denver, Colo.; Des Moines, Iowa; Houston, Texas; Memphis, Tenn.; Minneapolis, Minn.; New Orleans, La.; Oklahoma City, Okla.; Omaha, Neb.; San Antonio, Texas; Tulsa, Okla., and Wichita, Kan.

• New Carbomatic Headquarters

Carbomatic Corporation is removing its company headquarters from 117 West 63rd Street, Manhattan, to its own building, shown above, in the Long Island City section of New York City.

Transfer of the shop department to the new Long Island City brick-and-steel plant situated at 24-81 47th Street, will soon be completed. 5,000 square feet of floor space is available. Removal of other departments, including the executive offices, will follow—although the company expects to maintain a branch sales offices in Manhattan.

Manufacturing and engineering facilities will be expanded. An enlarged advisory service also is being set up, to give guidance to a growing number of industrialists who are exploring the modern techniques of heat-processing with infra-red.

• National Meeting, ACS

Recent advances in nuclear chemistry, food protection, petroleum, and plastics will be reported at the 112th national meeting of the American Chemical Society, which will be held in New York from September 15 to 19, it is announced by Dr. W. Albert Noyes, Jr., president of the society, and chairman of the department of chemistry in the University of Rochester.

Eleven thousand chemists and chemical engineers from all parts of the nation will participate in the meeting, which will be the largest in the history of the chemical profession. One hundred and twenty-four Local Sections of the Society will be represented.

The Priestley Medal will be presented to Professor Warren K. Lewis of Massachusetts Institute of Technology at a general meeting of the Society at the Manhattan Center on Monday evening, September 15. Professor Lewis, who was cited for "distinguished services to chemistry," will speak on "The Kinetics of the Reaction of Steam and Carbon Dioxide with Carbon."

Professor Glenn T. Seaborg of the University of California, co-discoverer of plutonium and a member of the general advisory committee of the United States Atomic Energy Commission, will address the general meeting on "Nuclear Transformations in the New High Energy Reaches." Professor Seaborg will receive the $1,000 American Chemical Society Award in Pure Chemistry, given by Alpha Chi Sigma, national chemical fraternity, for his achievements in nuclear chemistry.

Dr. Noyes, in his presidential address at the general meeting will discuss "The Mechanism of Photochemical Reaction."

• New Manufacturer's Agency

Charles H. Dunker, a member of the Nyanza Color and Chemical Co., Sales Organization in New England and formerly of Watson-Park Company, will shortly open a manufacturer's sales agency in San Diego, California, where he will represent a group of well-known textile mill suppliers on the West Coast.

Mr. Dunker plans a program which will include a complete line of products ranging from chemicals, dyestuffs and chemical specialties to textile machinery. Although definite arrangements have been made with a number of leading firms, Mr. Dunker

has not yet completed his line and will be interested in discussing the situation with other organizations desiring West Coast representation.

Mr. Dunker, who served as a Lieutenant Commander in the Aviation Ordnance Branch of the United States Navy in World War II, was graduated from William and Mary College with a B.S. degree in chemical engineering in 1932 and since that time has been representing the Nyanza Color and Chemical Company in the New England area on dyestuffs. His present address is 175 Dartmouth Street, Trinity Court Apartments, Boston, Massachusetts.

• Joins Carolina Aniline

Philip T. Butler has jonied the sales staff of The Carolina Aniline and Extract Company and has assumed charge of their Humiclean Department.

He will cover the entire United States, as necessary, but will devote his immediate attention to the Southern area.

Mr. Butler makes his headquarters at the home office in Charlotte, N. C.

• Booklet on Analysis of Water

A new 100 page technical bulletin on the analysis of municipal and industrial waters has been announced by the Solvay Sales Corporation. Designed to present methods suitable for rapid work without undue sacrifice in accuracy, the book contains sections on mineral analysis, stationary boiler water analysis, municipal and railroad water supplies, swimming pools and pollution.

It also gives information on reagents, indicators and standard solutions, conversion tables, a four page index and a list of atomic weights. Copies may be obtained without charge by writing to Solvay Sales Corporation, Advertising and Sales Promotion Department, 40 Rector Street, New York 6, New York, requesting Solvay Technical and Engineering Service Bulletin No. 11, "Water Analysis."

• DCAT Annual Meeting

Committee Chairmen for the 57th annual meeting of the Drug, Chemical and Allied Trades Section of the New York Board of Trade met recently to formulate plans for the Section's two-day meeting scheduled for Thursday and Friday, September 25th and 26th at Shawnee Inn, Shawnee-on-Delaware, Pennsylvania.

Dr. Carle M. Bigelow (Calco Chemical Div., American Cyanamid Company), DCAT Chairman, has appointed Fred J. Stock (V.P., Chas. Pfizer and Company) as General Chairman in charge of activities at Shawnee. A list of the scheduled events and the committee chairmen in charge follows:

Reception and Buffet Supper, Wednesday Evening—John P. Remensnyder (Heyden Chemical Corp.); *Golf, Thursday and Friday mornings*—Harold C. Green (L. Sonneborn Sons, Inc.) for the men, and Mrs. Lloyd I. Volckening for the ladies; *Business session, Thursday afternoon* — William T. Allen (Topics Publishing Company). This will include annual reports of officers and committee chairmen, election of new executive committee and speaker to be announced later.

Ladies activities, Thursday and Friday afternoons — Ralph E. Dorland (Dow Chemical Company); *Thursday Night Party* —Joseph F. Kelly (Hagerty Bros. and Co.); *Friday Night Banquet* (including installation of officers elected at breakfast meeting and awarding of golf prizes)—Robert B. Magnus (Magnus, Mabee & Reynard, Inc.).

Lloyd I. Volckening (The Ivers-Lee Company) is Chairman of the Reception Committee; Ira Vandewater (R. W. Greeff and Company) Chairman, Transportation Committee; Hugh Craig (Oil, Paint and Drug Reporter) Chairman, Publicity Committee.

• du Pont Executive Changes

The retirement of Willis F. Harrington as a member of the Executive Committee, and his resignation as a vice president of E. I. du Pont de Nemours and Company, effective August 1, were announced recently following a meeting of the Board of Directors. At the same time J. Warren Kinsman, general manager of the company's Fabrics and Finishes Department, and a member of the Board, was made a vice president and was designated as a member of the Executive Committee. Mr. Harrington will continue to serve as a member of the Board.

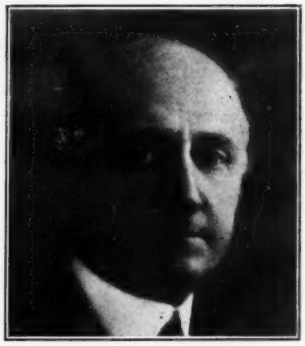
• Joins Triangle Chemical Co.

Harry E. Johnson who has been conducting a private consulting practice in Lake Worth, Florida and Macon, Georgia, for the past few years, has participated in the incorporation of the Triangle Chemical Company of Macon, Ga. He has been named executive vice-president and technical director of the new firm.

The company has just completed erection of new plant and laboratory buildings in Macon. They will specialize in the manufacture of textile chemicals, and related products.

ARTHUR F. WIEHL

ARTHUR F. Wiehl, for 27 years sales representative of Geigy Company, died in St. Vincent's Hospital on June 27th at the age of 70.



Arthur F. Wiehl

Born in New York City on December 10, 1876, Mr. Wiehl received his primary education in that city, his secondary education in Germany and completed his chemical education in the Evening School of Pratt Institute, Brooklyn, N. Y., in 1905. During his undergraduate days he won the Pratt Gold Medal for the invention of a dyestuff.

Following his graduation Mr. Wiehl was very active in the Evening Alumni Society and at one time or another held every office in this organization. He was also a member of the "Old Guard," comprising many of the older graduates engaged in the chemical and allied industries. In 1946 he was awarded the "Dr. Chas. M. Allen" medal for outstanding work in his field and for his great work in the interest of his Alma Mater.

In 1902 Mr. Wiehl joined H. A. Metz and Co. and remained with that organization for 18 years, and thereafter and until his death he was a member of the sales staff of Geigy Company, Inc.

During his 45 years in the dyestuff business, Mr. Wiehl became one of the most widely known and most beloved of that industry's "Knights of the Road." He had been a member of the Hamilton Club of Paterson, N. J., was very interested during his more active years in the New York Oil, Paint and Varnish Club and was one of the earliest members of the AATCC.

Mr. Wiehl, like his father, was a man of many talents. Besides having been a superb tournament tennis player, he was a talented violinist and played with some of the very popular symphony orchestras in the early part of the century. In the homes of many of his innumerable friends hang his paintings, sketches, as well as selections from his art collections. He also had more than a passing interest in Philatelics.

Mr. Wiehl is survived by his widow, two daughters and four grandchildren.

Proceedings of the
American Association of Textile Chemists and Colorists

August 11, 1947

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Secretary
Howard M. Waddle, West Point Mfg. Co., Shawmut, Ala.

Vice-Chairman: Matthew T. Barnhill
Treasurer: Allyn J. Morse

Student Chapters

Lowell Textile Institute
North Carolina State College
Philadelphia Textile Institute
New Bedford Textile Institute
Georgia School of Technology

Members should notify the Secretary immediately of all address changes

Report of Nominating Committee

THE Councilors representing Sections, in their capacity as Nominating Committee, have instructed the Secretary to report nominations for offices in 1948 as follows: For President, Henry F. Herrmann; for Vice Presidents, John N. Dalton and C. Norris Rabold.

The committee voted on the question whether it should nominate more than one candidate for each office to be filled, and decided to make no further nominations for the election of this year. It is provided, however, in the By-laws, that additional nominations for any elective office, signed by at least twenty-five Senior members, may be filed with the Secretary not later than October eighth. Such candidates will be listed on the ballot in equal standing with those named by the committee, which in the current year is likewise composed of twenty-five members.

Respectfully submitted,
H. C. CHAPIN
Secretary.

Committee on Non-Woven Fabrics

THE joint committee on Non-Woven Fabrics of the American Association of Textile Chemists and Colorists and American Society for Testing Materials held its second meeting at the Hotel Pennsylvania, New York, on June 5th to formulate further plans for setting up Test Methods and Instruments for the Evaluation of Non-Woven Fabrics. It was decided that the topic for discussion at the next meeting of this committee, which is to be held in Chicago, Illinois, in October, in connection with the National Convention of the AATCC, will be Tensile Testing Methods.

Interested parties may contact:
Gordon B. Harvey, ASTM,
P. O. Box 532,
Hopedale, Mass.
Kenneth Barnard, AATCC,
American Cynamid Co.,
Bound Brook, N. J.

Local Sections are requested to notify the AMERICAN DYESTUFF REPORTER – as soon as possible of their 1947-48 meeting dates

Purpose of the Chicago Convention

The Boston Convention commemorated the 25th Anniversary of the founding of our Association, rounding out an important era in the development of products and processes used in the textile industry. That quarter century also roughly coincided with that period in world affairs between the ends of the two World Wars.

With the exigencies of war now laid aside—we all hope, permanently—our industry faces a brilliant future of great development. What the next 25 years can bring in new textile fibers, dyeing and finishing improvements, would take a bold prophesy.

Through the collective research which this Association affords, as well as through our individual efforts, we will have incentives to point out the directions our progress should take.

Therefore, the Mid-West Section cordially invites you to this Convention, hoping your attendance will profit you in suggesting ways for the improvements constantly being made and that you may again enjoy the benefits of good fellowship.

CALENDAR

PHILADELPHIA SECTION
Meetings: September 26 (Kugler's, Philadelphia), November 8, January 16, 1948, February 27, 1948, April 9, 1948, May 21, 1948 (Bellevue-Stratford Hotel, Philadelphia).

NORTHERN NEW ENGLAND SECTION
Meetings: September 26, November 21.

SOUTH CENTRAL SECTION
Fall Outing, September 5th and 6th, (Lookout Mountain Hotel).

NATIONAL CONVENTION
October 23, 24, 25 (Congress Hotel, Chicago).

Annual Outing, New York Section

THE annual outing of the New York Section was held on Friday, June 20th, at the North Jersey Country Club. The usual golf tournament was held during the day and many took part in the horseshoe pitching tournament. An entertaining show was presented in the evening following the dinner.

Honors in the golfing tournament went to Paul A. Dunkel with a low gross of 77 for which he was presented with the cup donated by the Howes Publishing Company. Second low gross went to Sam Della Pinna with a score of 79. B. Snowdon received a special prize for a high score of 157.

The following were winners in the kickers handicap with a net of 76: E. H. Staab, W. L. Jaeger, Robert Brewer, M. J. Quigley, E. Bass, H. Danesi, W. H. Harris and C. Minoff.

The following were awarded prizes in the horseshoe pitching tournament: Oscar Bartenbach, H. Keenan and S. J. Ciongoli.

The committee for the outing was: *Chairman*—Emmett J. Driscoll; *Golf*—H. H. Todebush; *Finance*—John H. Hennessey; *Prizes and Entertainment*—Paul J. Luck; *Horseshoe Pitching*—Robert F. Holoch; *Press*—Winn W. Chase; *Dinner*—Charles W. Dorn; *Prize Awards*—Emmett J. Driscoll.

The attendance was about 260.

Respectfully submitted,
NORMAN A. JOHNSON, *Secretary*

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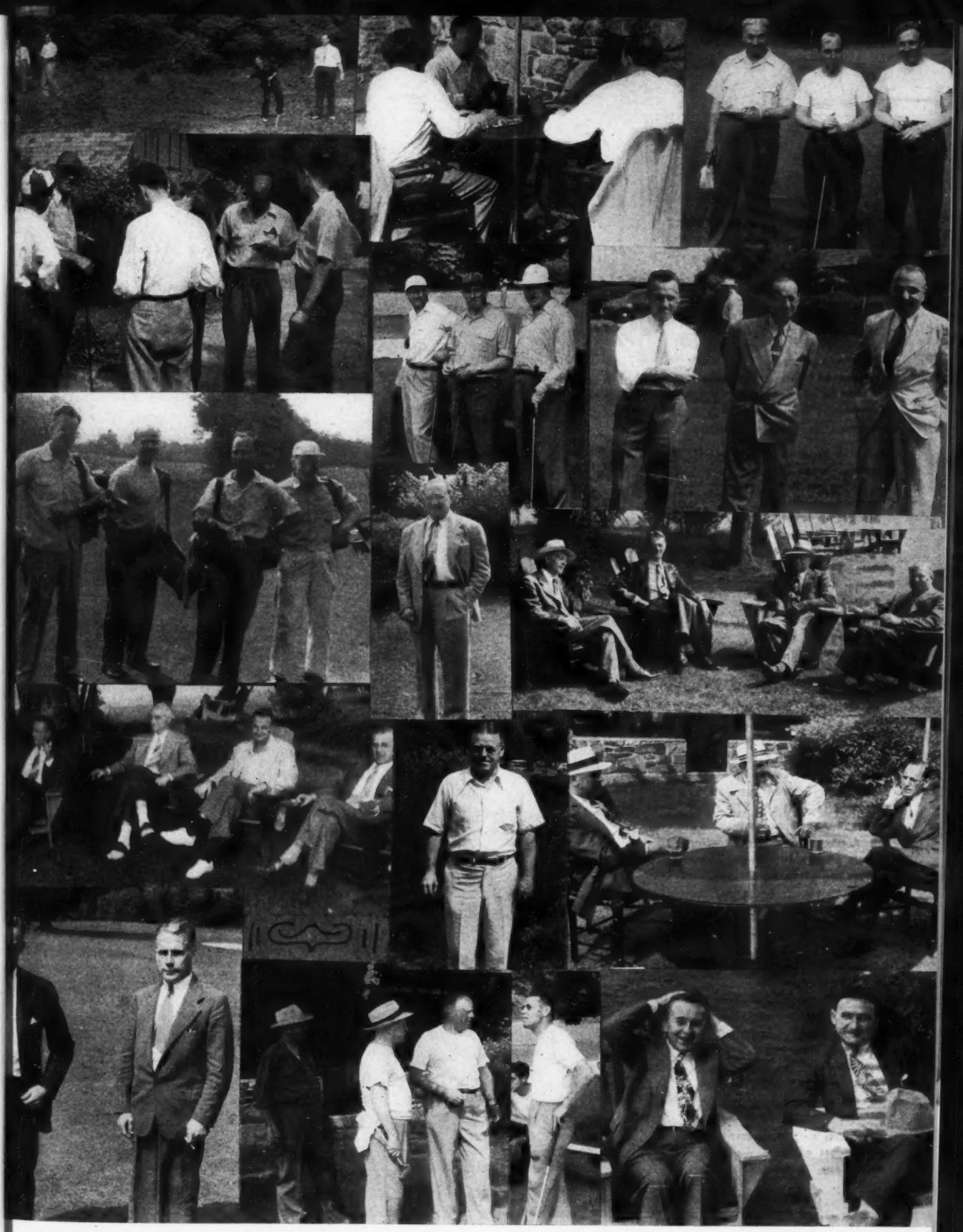


Technical Program

Chicago Convention — October 23, 24, 25, 1947

Theme: "Blazing Trails to Better Textiles"

General Meeting, Friday morning, October 24th 9:30 A.M.-12:00 Noon

Technical papers of general interest will be presented by invited speakers. The subjects will be of considerable importance to all members concerned with textile mill operations, research and development.

Group Meetings, Friday afternoon, October 24th 2:00 P.M.-5:00 P.M.

Six group meetings will be held simultaneously, dividing the membership as far as possible according to their specific interests. The groups will be designated as follows:

Cellulosic Fibers
Non-Cellulosic Fibers
Hosiery
Finishing and Auxiliaries
Testing
Fundamental Research

A chairman is being selected for each group, who will conduct the meeting and lead the discussion periods. Each session will include one or more papers by invitation on subjects of general interest to the group. In addition, an invitation is extended to all AATCC members and others engaged in technical activities in the above group classifications to contribute papers. Instructions for contributed papers are given below.

The titles of the group meetings are largely self-explanatory, but the following additional information will be of interest:

Cellulosic Fibers

The problems of cotton, rayon and acetate processing, and of products containing mixtures of these fibers, is to be covered. Papers are desired on new and modified procedures involving preparation, dyeing, and other aspects of the production of these materials. There is a specific interest in papers on new or improved machinery, as well as control instruments and instrumentation. Exhibition of models of new machines and instruments also is solicited.

Non-Cellulosic Fibers

This group will be concerned with wool and other protein fibers, nylon and other non-cellulosic synthetics, and all blends of these fibers. The interests are parallel with those listed under the Cellulosic Fibers group.

Hosiery

Chicago is an important center of the hosiery industry, and it is expected that there will be an unusual attendance from the South-Central Section, also a hosiery center. This group meeting will be open to all problems involved in the hosiery industry.

Finishing and Auxiliaries

Any and all aspects of this broad field are open for consideration at this meeting. There is a strongly expressed interest in the various new finishing processes and new chemical auxiliaries introduced in the post-war period.

Testing

A major function of the AATCC is the establishment of test methods, either through development under the AATCC research program or acceptance of methods submitted to the association. Papers will be welcome on new or modified test procedures and equipment, as well as evaluation of existing methods. The extension of test methods into end use evaluation is to be stressed in the future AATCC research program, and papers on any phase of this subject will be especially welcome.

Fundamental Research

The growing interest in fundamental research of many kinds relating to textile processing, and especially dyeing and finishing, suggests the desirability of a group for discussion of work in this field. Papers on original work and also reviews of the work of others and progress in fundamental studies are desired.

Contributed Papers

The following instructions and regulations are to be followed for contributed papers:

(1) Every one desiring to contribute a paper should advise Dr. M. A. Dahlen, Room 8518 Nemours Building, Wilmington, Delaware, *immediately*, giving the title of the proposed paper and the group in which it is to be presented. A statement should be made also as to whether fifteen, thirty or forty-five minutes is desired for presentation of the paper.

(2) As soon as the number of papers available for each group is known, a selection will be made for each group and the contributors will be advised as to whether their papers have been accepted. It is necessary to make this selection in the near future in order to present a well-balanced program.

(3) An abstract outlining the scope and nature of the paper will be required well in advance of the Convention, the date to be set later.

(4) The paper, as presented orally, may be an abridged version of the written paper.

(5) All papers in complete form ready for submission to the "American Dyestuff Reporter" for publication must be available at the time of the Convention. Earlier submission is desirable.

(6) Papers must not be primarily of an advertising or promotional character. However, the subject matter may present commercial products, machinery, instruments, processing procedures, etc., of a commercial nature provided they are treated from a technical standpoint.

(7) The Technical Program Committee must be the judge as to which papers are to be accepted, but an effort will be made to include all contributions considered suitable.

Suggested Papers

Many members may have ideas as to desirable topics for papers to be presented at the group meetings. All suggestions as to the subject of such papers, and also suggestions as to authors, will be welcome. These, too, should be sent promptly to Dr. M. A. Dahlen.

This is Your Meeting —

Participate by Offering a Paper!

Discussion Meeting on

Process Water

Southeastern Section, June 7, 1947

THE Southeastern Section had a very successful meeting at the Athletic Club in Atlanta, Georgia, on June 7, 1947.

The meeting was a question-and-answer program on "Process Water". Thirty-four questions were submitted in writing by the membership. A group of nine experts were invited to be present at the speakers' table to answer the questions. The Quiz Master, Leslie Bamberger of Lanett Bleachery & Dye Works, pulled questions at random. The experts by a show of hands indicated their willingness to answer the same.

The invited guests who served as experts were as follows: Owen C. Abbott, The Bristol Company, Atlanta, Georgia; M. C. Welker, Ion Exchange Products Department, American Cyanamid Company, New York, N. Y.; W. Douglas Smith, Calgon, Inc., Greenville, South Carolina; J. S. Kneale, The Permutit Company, Chattanooga, Tenn.; Mr. Weir, Mr. de Jarnette, Mr. Averette, Department of Public Health, Atlanta, Ga.; Fred Melcher, The Coca-Cola Company, Atlanta, Georgia; H. H. Morrison, Liquid Conditioning Corporation, Chatanooga, Tennessee.

After the introduction of the guests by Dr. Howard M. Waddle, Mr. Bamberger started the quizzing. A total of twenty questions were asked and answered. Due to insufficient time the questioning was stopped at 10:00 p.m.

The following is a resume of the questions and answers as recorded at the meeting by R. E. Hudson and H. M. Waddle of the Research Division, West Point Manufacturing Co., Ben Daniel of the Lanett Bleachery & Dye Works, Mayoh H. Newton of the Fairfax Mill Division, West Point Manufacturing Co., and Miss Richardson of the Research Division, Callaway Mills, and compiled by Mr. Hudson.

QUESTION 1—What is the difference between the so-called "temporary" and permanent hardness of water?
Asked by H. M. Waddle. Answered by Mr. Averette.

ANSWER

Carbonates are referred to as temporary hardness which in general may be removed by boiling or by treatment with lime.

Noncarbonates are known as permanent hardness and are difficult to remove.

QUESTION 2—If you were going to locate a plant in a soft water region, where in Georgia and Alabama would you locate it?
Asked by H. M. Waddle. Answered by Mr. Weir and Mr. de Jarnette.

ANSWER

No information was available on water in Alabama. A map of Georgia was exhibited which gave the specific hardness of both surface and ground water in all parts of the state.

In general, the state may be divided into three sections with respect to water hardness. A general tabulation follows:

Section	Ground	Surface
Northwest-Mountain	Hard	Hard
Piedmont	Hard	Soft
Coastal Plain	Hard	Soft

For a particular area, the detailed map should be consulted since there are exceptions in all parts of the state.

QUESTION 3—How closely can the pH of filtered river water be controlled without automatic equipment?
Asked by Leslie Bamberger. Answered by Owen C. Abbott and Mr. Weir.

ANSWER

The pH can be controlled very closely (± 0.2 pH), provided adequate manpower is available for frequent checks. The nature of automatic controls for this purpose is to eliminate manpower diverted to such control work.

In general, small reservoirs will require more frequent checks to insure a constant pH.

Mr. Weir pointed out the utility of "on the spot" control methods for prompt control of fluctuating conditions in the water as it is being treated, rather than depending on delayed results from a central control laboratory.

QUESTION 4—Briefly discuss "breakpoint" chlorination. Compare chlorine consumption and benefit where applied to the raw water or to the filtered water. Point out the advantages of the use of ammonia in conjunction with chlorination.
Asked by R. E. Hudson. Answered by Mr. de Jarnette.

ANSWER

"Breakpoint" chlorination refers to heavy chlorination in which sufficient chlorine is added to the water to initiate and complete oxidation of all easily oxidizable material present in the water. Ammonia compounds are said to be responsible for this "chlorine demand".

The chlorine demand of raw water is greater than that of filtered water.

Ammonia applied to water in conjunction with chlorine forms chloramine. The chloramine has the property of remaining in the water as such for much longer periods than chlorine. The chloramine is said to induce the breakpoint. The chloramine has a lower oxidation value than chlorine. Tests are better controlled with chlorine.

Ammonia is usually applied at the rate of 1 part of ammonia to 3-6 parts chlorine. The usual concentration of ammonia (less than 0.5 p.p.m.) will not affect copper or brass pipe.

QUESTION 5—Is it possible to have serious tuberculation of piping without large amounts of red water?
Asked by Leslie Bamberger. Answered by W. Douglas Smith and Fred Melcher.

ANSWER

Yes, serious tuberculation is possible without red water.

Where the pH is low, iron will be in the oxide form and appear as red water.

Where the pH is high, iron will be in the hydroxide form and appear as tubercles.

It was reported that pipe lines had been seen that were practically closed due to tuberculation, yet no red water had been delivered through the pipe.

Mr. Melcher advised that he had seen a number of cases of serious tuberculation due to high pH in water for the carbonated drink industry.

QUESTION 6—The "deionized" water using the resin exchange filters usually has a low pH of about 5.5.

(a) Is this water suitable for drinking purposes?

(b) If it is not, can it be made suitable for drinking purposes by aerating the deionized water?

Asked by P. E. Redding, Jr., Answered by M. C. Welker and Mr. Weir.

ANSWER

(a) Yes, it is suitable. The human body will adjust the pH to its own needs.

The pH of "deionized" water will probably be 6.5-6.7, i.e., approaching neutrality.

It was pointed out that deionizing systems do not remove bacteria.

QUESTION 7—Define pH and point out the probable effect of normal variations in the pH of process water on various textile processes such as:

(a) Kier boiling.
(b) Chlorine and peroxide bleaches.
(c) Detergent scouring.
(d) Various types of dyeing.
(e) Enzyme desize.
(f) Slasher size mixes.
(g) Finish size mixes.

Asked by R. E. Hudson. Answered by Leslie Bamberger and C. Russell Gill.

ANSWER

The effect of normal variations of pH of process water is negligible on (a), (b), (c)—so forget it.

The effect on (d) is an open question but usually insignificant.

The effect on (e) is variable but usually sensitive.

Mr. Gill advised that most size mixes (f) and (g) are on the acid size 6-6.8. He further stated that high pH produced foaming due to fat saponification to soaps.

QUESTION 8—Will Permutit Unit, useing Zeo-Carb, filter out any so-called red water from city mains? Discuss advantages of soda ash over lime for raising pH of filtered water.

Asked by Mr. Youngblood. Answered by J. S. Kneale and M. C. Welker.

ANSWER

(a) Yes, but it removes same only by means of its filtering action. If the particles are fine enough, they will pass on through. In such cases a filter unit would usually be installed ahead of the Permutit unit.

(b) Soda ash destroys the free CO_2 in water and does not raise the hardness. Twice as much soda ash as lime is required to perform the pH correction. Soda ash is 2-4 times as expensive as lime.

QUESTION 9—Does completely deionized water (cation and anion removal) have any application in textile processing? How does its costs compare with cation removal methods?

Asked by R. E. Hudson. Answered by M. C. Welker.

ANSWER

Completely deionized water is used (a) in the drug room, (b) in lowering the viscosity of PVA, (c) correcting streaked dyeing, and (d) as boiler feed water both for normal and high pressure boilers.

The cost of deionized water for boiler feed was given as six cents per 1000 gal. per 100 p.p.m. hardness to be removed.

QUESTION 10—Briefly point out the factors causing normal corrosion in water systems and causing "red water" conditions.

Asked by R. E. Hudson. Answered by W. Douglas Smith.

ANSWER

Improper conditions such as low pH and high CO_2 cause corrosion.

"Red water" may occur at any pH up to approximately 7.6 and in some cases may be due to improper chlorination.

QUESTION 11—Give an explanation of the increase of the pH of processed water on boiling and its effect on the viscosity of starch mixes and foaming in mill sizing operations.

Asked by C. Russell Gill. Answered by Mr. de Jarnette, J. Stallings, and Leslie Bamberger.

ANSWER

At the boil, CO_2 may be expelled and the pH raised such that foaming may occur. Alkali in the water may act on fats and glycerides to form soaps and thus cause foaming. Gluten and albuminoids will cause foaming. The water for size operations should be neutral to acidic to control foaming. Salts such as calcium and zinc chloride may be used to hold down the pH. Alkali-modified starches may cause foaming.

QUESTION 12—At what pH should your water be while bleaching with peroxide or chlorine?

Asked by Lee L. Baker. Answered by H. H. Morrison.

ANSWER

The pH of the water is of no consequence on the pH of the peroxide and chlorine bleach baths. However, the pH of the water is important to this operation since iron pickup by the water in the lines is affected by the pH of the water.

QUESTION 13—What are the advantages of chlorination of raw water before filtration?

Asked by Leslie Bamberger. Answered by Mr. Weir.

ANSWER

The following advantages were listed:

1. Bacterial load on the filters may be reduced.
2. Odor and taste are reduced.
3. Oxidation of organic matter.
4. Algae and slime in the lines and filters may be controlled.
5. Prevents decomposition of sludge in coagulation basis.
6. Some oxidation of iron, etc., may occur.
7. May aid flocculation but not extensively.
8. Helps change collodial form to improve coagulation.

QUESTION 14—What troubles besides foaming have you been able to trace to deficient process water used in sizing? How were these eliminated?

Asked by Paul Seydel. Answered by C. Russell Gill.

ANSWER

The statement was made that no other trouble due to water is known.

QUESTION 15—What analysis would a good process water for vat dyeing of yarn on packages or beams show with the following in mind: calcium, magnesium, iron, copper, manganese, aluminum, other total water soluble dissolved inorganic salts, and dissolved organic matter? What of pH?

Asked by M. T. Barnhill. Answered by W. Douglas Smith.

ANSWER

A good process water for vat dyeing should contain not over the following amounts:

Calcium	5 p.p.m.
Magnesium	——
Iron	0.1 p.p.m.
Copper	0 - trace
Manganese	trace
Aluminum	0.05 p.p.m.

The other materials were not given.

(*Concluded on Page P454*)

One Hundred and Fifty-Eighth Council Meeting

THE Council held it 158th meeting in the Hotel Pennsylvania, New York, N. Y., on Friday morning, June 6, 1947. Present were President Henry F. Herrmann, presiding; John N. Dalton and C. Norris Rabold, Vice Presidents; William R. Moorhouse, Treasurer; Louis A. Olney, Chairman of the Research Committee; William D. Appel, William H. Cady, Carl Z. Draves and P. J. Wood, Past Presidents; Edward S. Chapin, Kenneth R. Fox and Walter J. Hamburger representing Northern New England; Ralph F. Culver, Raymond W. Jacoby and Harold B. Sturtevant representing Rhode Island; George L. Baxter, Emmett J. Driscoll, Patrick J. Kennedy, Leonard S. Little and Harold H. Taylor representing New York; Boyce C. Bond, Arthur W. Etchells, Walter F. Fancourt 3d, Edwin C. Dreby and Percival Theel representing Philadelphia; Leland G. Atkins, Wyss L. Barker and R. Hobart Souther representing Piedmont; Raymond B. Seymour representing South Central; Robert W. Philip representing Southeast; Eric W. Camp and Samuel Klein representing Mid-West; J. Robert Bonnar, Chairman of the Executive Committee on Research; Miles A. Dahlen, Chairman of the Technical Program Committee; Al J. Feit, Chairman of the Mid-West Section; Harold W. Stiegler, Research Director, and Harold C. Chapin, Secretary.

The Secretary's report of the 157th Council meeting and financial report of May 28, and the Treasurer's report of May 21, were accepted. The budget presented by the Appropriations Committee for the year beginning August 1, was approved. A proposed contract with the Howes Publishing Co., covering regular publication of the Year Book as well as the Reporter, was approved subject to certain minor amendments. The resignation of Dr. Olney as Chairman of the Research Committee was accepted with regret, to take effect within the current calendar year upon appointment of his successor. Dr. H. C. Chapin was appointed full-time Secretary of the Association from August 1. Authorized by the Council, the President appointed a special Committee on Policy, consisting of Leonard S. Little, Chairman, W. D. Appel, H. C. Chapin, C. Z. Draves, E. H. Killheffer, W. R. Moorhouse, T. R. Smith and P. J. Wood. Membership of the Technical Program Committee was changed by resignation of B. W. Phillip, and appointment of H. Boxser, S. J. Davis, V. B. Holland and R. B. Seymour.

Various proposals were made for improvement of the quantity and quality of papers in the proceedings, through editing and financial assistance. These were referred to the Publications and Technical Program Committees for further consideration. The Secretary was instructed to arrange for purchase and resale of not more than 50 reprints of the old Colour Index. Mr. Cady reported progress on compilation of the new edition.

Mr. Bonnar reported that a representative group of research executives, meeting the evening before at invitation of the Executive Committee on Research, had advised concentrating research on test methods, with further thought to their bearing on use of goods by ultimate consumers, and with consideration of advisability of operating a pilot plant for study of textile problems at some time in the future. As a representative of the Association on Committee L-14 of the American Standards Association, he requested approval of a change in title and scope of that committee, subsequently approved by our Research Committee, to, "Sectional Committee on Textile Testing Methods L-14," concerned with "Correlation of Standards covering test methods for textiles, and the evaluation and interpretation of data obtained from such tests—the work to be based upon standards developed by cooperating organizations." It was announced that hereafter all Association publicity would circulate through Winn W. Chase, Chairman of the Publicity Committee.

Mr. Feit and Mr. Klein reported for the Mid-West Section and its plans for the Chicago convention, October 23 to 25, Mr. Driscoll for the Convention Committee, Dr. Dahlen for the Technical Program Committee and Mr. Kennedy on the Intersectional Contest.

Each of the following was elected to the class of membership specified, as of thirty days from publication of application, provided no objection be received meanwhile by the Secretary.

SENIOR

W. W. Alderman	W. J. Bennett, Jr.
R. P. Anstell	A. R. Binder
F. G. Arnold	W. F. Blair
F. A. Baggesen	W. B. Broadbent
R. O. Barry	F. F. Burke
I. Beiley	W. R. Burrow

(Continued on Page P453)

SECRETARY'S FINANCIAL REPORT—MAY 28, 1947

	Applications	Dues, regular and reinstate	Dues, Corporate and Sustaining	Miscellaneous	Totals
Received and transmitted to Treasurer:					
August 1, 1946 to March 13, 1947	3,557.50	28,721.00	33,475.00	15,570.98	81,324.48
March 13 to May 29, 1947	1,049.00	1,499.50	700.00	4,038.46*	7,286.96
Total in fiscal year	4,606.50	30,220.50	34,175.00	19,609.44	88,611.44
Leaving deposited by Treasurer with Secretary					2,000.00

Miscellaneous items *

Dividends and interest		317.80
C.W.S. contract		882.52
Quartermaster contract		929.57
Royalties, Flammability Testers		484.00
Reporters and Reprints		49.65
Year Books		221.05
Crock meters		358.00
Crock cloth		85.00
Water test apparatus		121.50
Knitted tubing		88.50
Moth cloth		293.00
Multifiber cloth		88.00
Gas fading units		32.05
Dyed standards		54.00
Color transfer charts		25.00
Buttons		10.00
		4,039.64
Bank charges		1.18
		4,038.46

One Hundred and Fifty-First
Meeting of the Research Committee

THE 151st meeting of the Research Committee followed the Council meeting in New York on Friday afternoon, June 6, 1947, with Chairman Louis A. Olney presiding. Present were W. D. Appel, L. G. Atkins, P. J. Ariente, G. I. Baxter, J. R. Bonnar, W. vonBergen, W. H. Cady, E. S. Chapin, H. Christison, W. E. Coughlin, R. F. Culver, J. N. Dalton, J. D. Dean, C. W. Dorn, E. C. Dreby, A. W. Etchells, I. J. Gruntfest, H. E. Hager, S. L. Hayes, H. F. Herrmann, W. A. Holst, R. W. Jacoby, A. E. Johnson, N. A. Johnson, P. J. Kennedy, D. P. Knowland, L. S. Little, J. E. Lynn, O. F. Marks, J. E. Meili, W. R. Moorhouse, A. D. Nute, F. J. O'Neil, W. F. Prien, F. A. Prisley, C. N. Rabold, C. H. A. Schmitt, W. M. Scott, C. A. Seibert, R. H. Souther, J. A. Stevenson, H. W. Stiegler, H. B. Sturtevant, F. Stutz, F. Tripp, P. J. Wood, H. L. Young, and H. C. Chapin.

The Chairman announced his resignation to take effect within the current calendar year, upon appointment of his successor. Mr. Bonnar reported for the Executive Committee on Research, on a recent meeting of the committee at the Lowell Laboratories; on a questionnaire about to be mailed to members regarding their research facilities, interests and possibilities of research by local groups; on arrangements for handling all publicity through Mr. Winn Chase, with assistance to him through summaries of Research Committee meetings given him shortly after each meeting; on present efforts of the American Standards Association to condense a variety of national standards into international; and on a meeting the evening before of twenty-five chemists representing various interests invited to advise the committee on the general outline of its program. It was the advice of this group that development and improvement of test methods be given first consideration, with efforts to correlate these with service of products in the hands of ultimate consumers; that the Association should not go deeply into costly and time consuming fundamental research; but that it investigate the possibility of operating a pilot plant for study of textile problems at some time in the future. He reported changes in title and scope of ASA committee L 14, approved by the AATCC Council, conditional upon the approval of the Research Committee, broadening the scope of the ASA committee to include, "Correlation of Standards covering test methods for textiles, and the evaluation of data obtained from such tests—the work to be based upon standards developed by cooperating organizations." Approval was voted.

Kenneth R. Fox, President of the Lowell Textile Institute, was made a member of the committee, and spoke as follows:

"I appreciate very much this honor of being made a member of your Research Committee. I think I have had opportunity to speak to most of you before about how happy I am personally that the National research headquarters of the Association are at the Lowell Textile Institute. This arrangement I am sure is workable today and will be workable in the future. I will be somewhat personal and say that the Institute, I am sure, benefits by the arrangement, and I sincerely hope that the Association shares that feeling.

"I would like to make an announcement. This has not been made public yet, and I cannot quote names or companies, but I would like to tell this group that last week the entire control laboratories of one of the largest chains of textile mills in the country were given to the Lowell Textile Institute. In that gift is about $60,000 worth of testing equipment. A tentative plan discussed with Dr. Stiegler and the head of the Chemistry Department at the Institute calls for construction of another constant temperature, constant humidity, room alongside of the room you now have. That will double the facilities in this one area alone. Naturally the gift is primarily for our own educational program, but the equipment and space will be available for your research, and I think it a material contribution."

Dr. Stiegler reported engagement of two more assistants for the summer. The Detergency Machine he said was in Lawrence, being tested for reproducibility of results on wool, and for action on certain types of oil. It was then to go to V. B. Holland of Cannon Mills, Chairman of the Southern group working on cotton. New machines were being constructed with minor improvements. On the Quartermaster project, concerning fastness of olive-drab dyeings on cotton, over 10,000 yards of goods had been put through fourteen methods of preparation and three of dyeing in commercial finishing plants. The machine for determining dimensional restorability was being given further tests under the American Viscose Company scholarships. On cotton results were reproducible; on rayon differences from yard to yard of goods were greater than the inconsistencies in the machine. Suggestions and cloth samples would be welcomed. To work on the wash fastness tests, transferred to Lowell, a new man had been assigned. Various devices were being tried in the Launderometer for simulating the greater abrasion due to larger volume employed in commercial laundering. For water repellency fourteen methods of test were being applied to fourteen army fabrics and seven civilian, to obtain comparative data on test methods. Preparations were under way for marketing the duPont Rain Tester. Five laboratories were engaged in an elaborate program of comparative tests. The duPont laboratories were working on their own Rain Tester, and Spray, Hydrostatic, Impact Penetration, Immersion and Absorption tests. The National Bureau of Standards was working on Contact Angle and Wetting Time. The Philadelphia Quartermaster Depot was working on Drop Penetration and the Rain Room. The Southern Regional Research Laboratory was working on the Bundesmann Tester. The Association's Lowell laboratory was working on the Spray, AATCC Hydrostatic, Suter Hydrostatic, Impact Penetration, Immersion Absorption and Dynamic Absorption tests; the Cook, duPont, Lowell and Sea Island Mills testers; air and vapor permeability.

In a summary of three years' work of the Washfastness Committee to date, Mr. Seibert gave a tabulation of 15,000 samples washed by commercial laundries in eleven different states, 5,000 samples washed under direction of the committee in three types of home laundry washers, and 5,000 washed in the Launderometer according to the Association's number three wash test method. On an average, twelve laundry washings effected the same color destruction as twenty-two AATCC number

three tests in the Launderometer, but among the laundries the average for one was seventeen washings, for another but five. Obviously a test based on the average of twelve washings would be too rigorous to represent the first extreme, but far too mild to represent the second. On individual samples the difference in laundry treatment were even greater. How then can a test be devised which will predict what any laundry will do to a fabric, and how can a manufacturer guarantee the performance of his product under unpredictable laundry treatment?

Albert E. Johnson of the National Association of Dyers and Cleaners spoke on the problems of his industry as follows: "I think most of you are familiar with our activities in the Research Department at Silver Spring, Maryland. Perhaps a section of that department is not too well known to you, the Package Analysis Department, where we receive samples of textile failures from our 6,000 members all over the country. We describe these as failures from our point of view. Some are due to abnormal consumer soil such as acid from a battery contacting a man's trousers. A second type is due to dry cleaner inefficiency, regarding which we do not hesitate to inform the cleaner. For a third type we have no answer. One of the principal troubles is with trimmings. We have very little trouble in cleaning outer fabrics which we can see. The main trouble is with fabrics which we do not see, such as the buckram in a lapel, or perhaps the lining added to give warmth or support to the outer fabric. I brought along a sample. This rayon lining is perfectly good and withstands normal cleaning, but both this inside fabric and the outside, of wool, have been so affected by cleaning operations as to show this big black stain. It is necessary to apply water to water fixed stains, and the dry cleaner cannot help himself on this. When we do that in garments of this type we can't very well afford to take every garment apart to find what is inside, and we sometimes find that a fugitive material inside causes stains beyond repair. Either we tell the customer we can do nothing about it, or we pay the bill; and believe it or not, dry cleaners have been quite generous in settling complaints of this type. Sometimes the complainant goes back to the retailer, especially if the dry cleaner has said after preliminary examination of the garment that he cannot clean it. The consumer can't be expected to see what is inside, and I don't think the dry cleaner will ever be able to tell what is inside and handle the garment accordingly. We have talked to manufacturers, retailers and other groups who seem to feel that in trimmings the use of dyes with certain specifications should be established. Apparently the difference in price between a fast dye and types commonly used in these materials is wide, and it occurred to me that the AATCC might conduct a study, if it has not already done so, to determine what minimum specifications might be laid down for satisfactory dyes in trimmings, to include buckram, seam bindings, threads and so on, which are giving us trouble today. We would then be in a position to take these findings to jobbers, converters, manufacturers and retailers, saying we insist on these minimum specifications because in this way we can build ultimate consumer confidence in the goods they buy."

Mr. Prisley reported on minor improvements in the Detergency Machine, means of increasing pressure on the squeeze rolls and of controlling fabric between take-off roll and bath. More data on accuracy of tests could be obtained if members of the Association would send in samples of soiled fabric and detergents of characteristics proved by experience. Also under investigation was a machine to produce a knitted tubing for tests, more like woven fabric than that now in use. Another section of the committee had been organized to develop standard soiled fabrics of both cotton and wool for test purposes.

For the Committee on Fastness to Light, Mr. Holst reported an attachment under consideration for the Fadeometer to keep samples in vertical alignment, also the recommendation that shiny metal surfaces within the machine be dulled by matte paint or other means. Work on calibration papers at the National Bureau of Standards had already reached the point where papers could be distributed to the industry for trial.

Mr. Dalton reported reorganization of the Committee on Perspiration, and work contemplated, on preliminary pH of samples, effect of salt in the test solution, comparison of the plate method with the present test, type of test cloth, change in shade and staining. For the Committee on Transference of Color, Mr. Knowland reported work on development of a viewing device for measurement of small color changes.

For Professor Theel, Chairman of the Committee on Analytical Methods, Mr. Etchells reported that five sections of the new book were finished. Dr. Olney reported the 1946 Year Book in process of mailing. The next volume would be the 1947-1948 book, to be issued under a new contract which would insure prompt mailing in August, 1948, provided that those responsible for copy submitted this according to schedule. Its page size would be about that of the Reporter, and it would bear the name, "Technical Manual and Year Book of the American Association of Textile Chemists and Colorists."

Reporting progress on the new Colour Index, Mr. Cady said that differences between our fastness tests and those of the British society had emphasized the need of international standards. Inquiry as to what extent manufacturers would disclose the chemical constitution of new dyes in the publication brought the reply that constitution of any dye made by more than one manufacturer would doubtless be disclosed. Mr. Cady hoped to arrange for the inclusion of photospectrometric curves. Mr. Little reported that the American Standards Association was presenting for consideration by the International Standards Committee of the United Nations fifty-seven test methods, many of them from the AATCC.

A written report was received from the new joint committee of the ASTM and AATCC on Non-woven Fabrics, outlining plans for a conference on Tensile Testing Methods at the convention of the Association in Chicago, Oct. 23 to 25. Those interested were referred to K. H. Barnard or G. B. Harvey.

For the Committee on Ageing of Textiles, Mr. Dean suggested combination with Mr. Cady's Committee on Deterioration of Textile Fibers Exposed to Light. A survey of work on accelerated ageing in various laboratories was about ready for publication. Dr. Coughlin reported that the Committee on Dimensional Change of Textiles had decided to study shrinkage of woven wool fabrics in laundering, through groups in the New York and Boston areas. Philadelphia was already working on socks. The Washfastness Committee had made available for shrinkage tests a number of rayon samples supposedly stabilized by commercial laundering.

Respectfully submitted,

H. C. CHAPIN

Secretary.

Council Meeting

(Continued from Page P451)

N. J. Callahan	G. I. Dozier
C. B. Capron	J. T. Duffy
J. N. Caudle	G. J. Elkins
G. S. Chase	S. A. Feimster
T. S. Clarke	J. H. Ferguson
M. H. Cooper	K. P. Ferguson
S. M. Dadone	H. L. Fogle
N. Dardinne	J. A. Fraser
C. E. Deglialberti	B. C. Gallagher
C. H. Dickinson, Jr.	R. F. Gariepy
J. J. Dillon	D. D. Gagliardi
J. G. Dobson	H. W. Geering

J. B. Gibbs	E. A. Perisanoglu
C. L. Glass	H. E. Peterson
H. E. Glidden	K. L. Pierce
R. S. Highling	B. A. Poladian
A. W. Harvey	N. L. Price
C. L. Hawkins	O. L. Price
G. H. Hulbert	C. B. Quaintance
W. P. Hussey	F. Raff
C. L. Jenkins	J. M. Roca
F. N. C. Jerauld, Jr.	C. S. Sharples
P. B. Klier	J. M. Shore
B. B. Korzen	A. Siemons
E. A. Krahenbuhl	H. G. Smith
K. Kristoffersen	L. E. Smith
J. G. Lankler	S. Sopoci
J. C. Littlefield	C. E. Stevens
L. Lucini	A. L. Sugden
J. R. Markgren	R. M. Tanner, Jr.
R. C. Martin	F. V. Tribble
O. S. McCullers	N. A. Trumbull
W. W. Metcalfe	J. A. Turner
J. W. Miles	T. Venturini
L. S. Molendyke	F. D. Wallace
J. S. Naylor	M. A. Waterhouse
G. L. O'Malley	H. A. Webb
F. A. Orleans	W. W. Webb
J. E. Ormiston, Jr.	R. Weiss
H. L. Ortstein	S. A. White
L. A. Parker	R. H. Williams
J. M. Patton	

JUNIOR

P. A. Celella	S. Kaplan
S. Chwastyk	W. McBride
M. P. Coulman	B. G. Pugh
L. Finkelstein	J. M. Ross
W. D. Johnston, Jr.	K. E. Shapiro

ASSOCIATE

C. S. Arms	H. T. Nelson
J. A. Burkart	E. L. Reeves
T. E. Carlson	W. E. Rettew
H. A. Goldsmith	L. L. Rona
J. D. Haynes	A. A. Schwartz
M. V. Iyer	W. Stamm
O. Johnson	G. D. Stehlin
J. S. Kneale	F. E. Stone
D. M. Liles	R. V. Swanstrom
J. D. MacNamara	A. J. Tirri
T. C. McKenzie	E. Wolfenson

STUDENT

R. A. Dubreuil	A. A. Kuehn
W. E. Flister	N. E. Rollins
F. B. Gardner, Jr.	D. D. Sanders
D. T. Koshak	R. E. Wishart

Respectfully submitted,

HAROLD C. CHAPIN,

Secretary.

Process Water—

(Concluded from Page P450)

The pH of a good process water for vat dyeing should be neutral to 7.6 if iron pickup from the piping could be avoided.

In response to a floor question as to how to prevent iron pickup at the lower pH, Mr. Smith advised the use of Calgon at the filter plant.

QUESTION 16—Has anyone had experience with "chemical degradation of cellulose" due to a bacteria in treated water? If so, what was the type and the cure?

Asked by H. A. Dickert.

ANSWER

No experience of this nature had been encountered.

QUESTION 17—Can the hardness in process water be completely controlled by chemical additives for various textile processes?

Asked by R. E. Hudson. Answered by W. Douglas Smith.

ANSWER

Yes, but for practical purposes, no. Sodium hexametaphosphate does the complete job but its use for such purposes is not practical. One and two-thirds ounces of sodium hexametaphosphate per grain per gallon hardness per 100 gallons of water was suggested as adequate for complete control of the hardness in process water.

The use of a water softener followed by a suitable small amount of the metaphosphate was suggested as being the most practical approach to completely controlling water hardness.

QUESTION 18—Briefly discuss boiler scale, corrosion, embrittlement, carryover together with the chemical agents used in external and internal boiler water treatment and the function of each. Can boiler scale always be controlled?

Asked by R. E. Hudson. Answered by W. Douglas Smith and H. H. Morrison.

ANSWER

It is generally accepted that boiler scale can be maintained as soft scale through use of the orthophosphates.

The cause of embrittlement has been assigned to the concentration of caustic on the boiler surface to cause intercrystalline attack. A new theory has to do with the attack by silica in the presence of caustic.

Carryover is caused by high concentration of solids in the water in the boiler, varying and sudden steam demand, and incorrect pH.

Corrosion in the boiler is promoted by CO_2, O_2, Cl_2, chlorides, and freedom of boiler surface from scale. By heating the boiler feed water above 212°F. (215-218° F.), all O_2 and CO_2 are removed. By adding a small amount of sodium sulfite, the residual trace of oxygen and chlorine may be removed.

Where carbonates are breaking down in the boiler, the feed water is generally treated with caustic soda.

Where deionized water is used, silica remains in the water. This water should be treated with caustic soda in the ratio of $NaOH:SiO_2$: : 1 + 5 p.p.m. : 1.

Paschal E. Redding contributed the thought that nitrates are coming into use for embrittlement control.

QUESTION 19—How can Rhodamine "B" be removed from process water?

Asked by W. B. Griffin. Answered by H. H. Morrison.

ANSWER

No specific information was available. It was suggested that trials be made for removal by means of coagulation and filtration or activated carbon.

QUESTION 20—Does the Zeolite softening process change the pH of water?

Asked by W. B. Griffin. Answered by J. S. Kneale and M. C. Welker.

ANSWER

The Zeolite process merely releases two sodium ions while collecting one calcium ion. The effect on the pH of the water is dictated by the difference in effect of the corresponding ions.

The synthetic resins in general raise the pH by 1.0 unit, e.g., 7.5 to 8.5.

* * * *

Due to the time consumed to this point, it was necessary to adjourn the meeting without answering further questions.

A Simple Laboratory Method for Evaluation of Detergency

A. J. KELLY and D. H. GUNTHER

Burkart-Schier Chemical Company

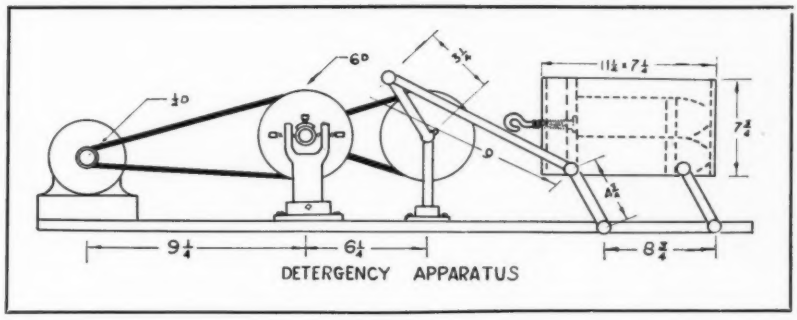
IN experimental studies of detergents and detergency, a need was felt for a simple and rapid, but effective, method of comparing detergent products. The object was a procedure to supplement rather than supplant work involving the use of Launderometer, Reflectometer, etc. However, the device described below can be very effectively used where these more precise instruments are not available. The procedure listed has been employed over a considerable period of time and is simple and gives good reproducibility of results.

Essentially, it consists of agitating soiled swatches of cotton and of wool in a solution of the detergent or detergents at a constant temperature for a fixed period of time. Uniform agitation is obtained by means of the shaking machine illustrated. Maintenance of temperature, without constant temperature baths or other elaborate equipment, is easily obtained by the use of Thermos bottles. No rubber balls or other means of extra agitation are employed, as it is found that the shaking action is generally adequate, and danger of breaking the glass linings of the bottles is obviated.

Apparatus and Materials

(1) Apparatus as shown in sketch. This can be readily constructed, and modified as desired since the aim is comparative rather than absolute values. The construction indicated was influenced by the materials available at the time. Power is supplied by a small fractional horsepower motor, and the double speed reduction obtained from the two V-belt and pulley sets results in a reciprocating motion of about sixty complete cycles per minute for the shaking box. Length of stroke is 7". Inside dimensions of box: Length 11", width 6½", depth 7¾".

(2) Four pint-size vacuum bottles ("Thermos" bottles manufactured by American Thermos Bottle Company, or equivalent). The bottles are numbered. If it is desired to evaluate more than four samples per run a larger box can be used. A simple screw clamp for holding the bottles snug is helpful.



DETERGENCY APPARATUS

(3) Prepared soiled fabrics (both cotton and wool). The soiling formula is a matter of choice, although a combination of lampblack, tallow and white mineral oil, dispersed in carbon tetrachloride, is commonly employed.

(4) Electric iron.

Procedure:

(1) Cut 2" x 3" swatches of the soiled fabrics, preferably with pinking shears to avoid fraying during test.

(2) Into each Thermos bottle enter 400 ml of water at 140°F. Stopper and allow to preheat for approximately 5 minutes. This water is discarded just before the bottles are charged with detergent solution.

(3) Make up 300 ml of test solution for each bottle and bring to 140°F. In making up the test solutions it has been found advantageous to select a detergent of known efficiency and use it at a predetermined concentration as a "standard." In each test run, one bottle can be filled with this solution and the other bottles with solutions of agents to be evaluated. If a 0.2 per cent concentration of the standard is used, then the other solutions can be made up on a money value basis. For example:

$$\frac{\text{Cost per pound of standard} \times 0.2\%}{\text{Cost per pound of agent evaluated per cent of agent.}} =$$

If the standard costs 25c per pound, and the product to be compared costs 10c per pound, then $\frac{25 \times 0.2}{10} = 0.5\%$ (amount required).

(4) Enter the test solutions into the numbered bottles immediately upon discarding the preheating water. Stopper the bottles until ready to enter the swatches.

(5) Working rapidly, put a swatch each of soiled cotton and soiled wool fabric in each bottle. Enter swatches separately so that they do not cling together.

(6) Stopper the bottles firmly, cap, and place in shaking box. Tighten clamp to hold bottles steady.

(7) Start motor and run exactly 20 minutes. An inexpensive photographic timer with alarm can be used to advantage.

(8) Stop motor, remove bottles, and pour contents of each bottle into a correspondingly numbered 600 ml beaker. (At this stage it is often possible to know at a glance the result—a good detergent will show a darkly colored solution due to soil removal, a poor detergent will show a relatively clear solution).

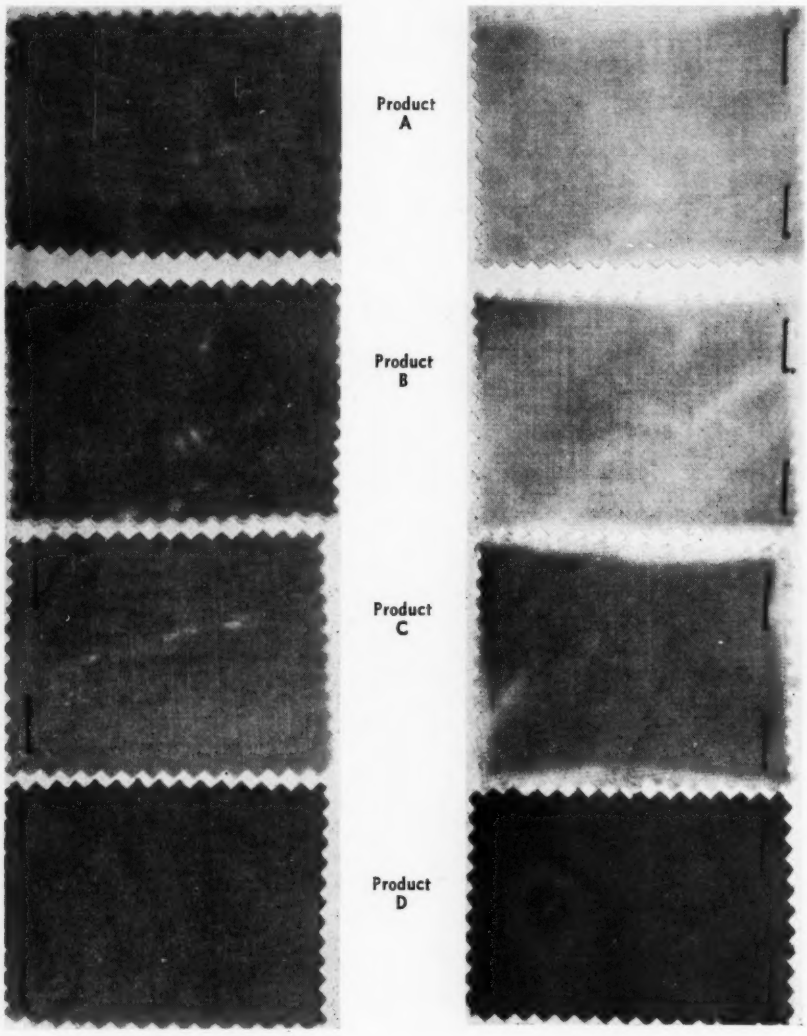
(9) Rapidly remove the swatches from the beakers and immerse in cold water (60 to 80°F.) to arrest the detergent action. Rinse thoroughly.

(10) Iron the swatches dry, and mount for examination and filing, or merely compare visually. If a reflectometer is used for comparisons it may be necessary to modify the size of the swatches.

There is a total temperature drop of about 5° during the run, due mostly to cooling while transferring the solutions and adding the swatches. Since this drop is practically uniform in all cases, the

* Submitted for publication by the Cotton Synthetic Group of the Committee on Detergency.

DETERGENCY TEST



effect is negligible.

Some detergents are most effective at temperatures higher than 140°F. Likewise the addition of alkalis or electrolytes may have a greater or lesser effect. If the actual plant conditions such as temperature, time, pH, etc. are known then the test procedure can be modified to simulate a mill run. No single arbitrary set of test conditions can possibly serve all needs.

Excellent reproducibility of results has been noted. Slight variations are probably due more to ageing of the soiled fabrics than to errors of technique or apparatus. The inclusion of a standard test in each run has been suggested to lessen the effect of variables but actually this has been found to be hardly necessary.

Based on comparisons of the scoured swatches with the original soiled fabrics, the results are roughly rated as excellent, good, fair, or poor. Intermediate effects can be noted, or evaluations made in any desired way. A visual comparison is entirely adequate for most routine checks.

The illustration depicts a sheet mounting four sets of swatches from a single run. On the left are the cotton swatches, and on the right the wool. Generally, a small cut of each of the original soiled fabrics would be stapled to the sheet.

On the basis of experience, the apparatus and procedure outlined can be recommended for making routine detergency tests. It will be found useful even where more elaborate equipment is available, and will provide any laboratory with an economical means of comparing detergents and detergency.

EMPLOYMENT REGISTER

This column is open for four insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Lowell Textile Institute, Lowell, Mass. It is understood that these will be open to inspection by prospective employers, who can obtain further information through the code numbers from the Secretary.

47-29

Education: Equivalent of two years college in Germany, and Textile College in Czechoslovakia; also commercial background.

Experience: Finishing, dyeing and laboratory testing in Europe and India; specializing in worsteds, woolens and mixtures; production control.

Age 31; married, has received first papers for U. S. citizenship. Work in metropolitan area preferred; will train, with chances of promotion.

47-30

Education: Graduate, Bradford Durfee Textile Institute.

Experience: Dye laboratory, executive management of dyeing and finishing, various threads, cotton goods, printing.

Age 38; married; references.

47-31

Education: B.Sc. & M.Sc., Philadelphia College of Pharmacy & Science.

Experience: Research chemist, Director of Research & Quality Control, surgical and textile goods.

Age 33; married; references.

47-32

Education: Textile Chemical Engineer, State College, Austria.

Experience: Dyeing and finishing on a variety of fibers and products with executive responsibility, development and sales promotion.

Age 31; married; references; New York City or West Coast preferred.

47-33

Education: Graduate vocational school, with additional college courses in chemistry.

Experience: Laboratory dyeing and testing; dyer of yarns and hosiery with executive responsibilities in dyehouse.

Age 31; married; will go anywhere in U. S.; New York area preferred because residence available.

47-34

Education: Columbia University, one year.

Experience: Laboratory asst., and operator of most machines in bleachery and dye house.

Age 35; married; references; prefers N. E. or N. Y.

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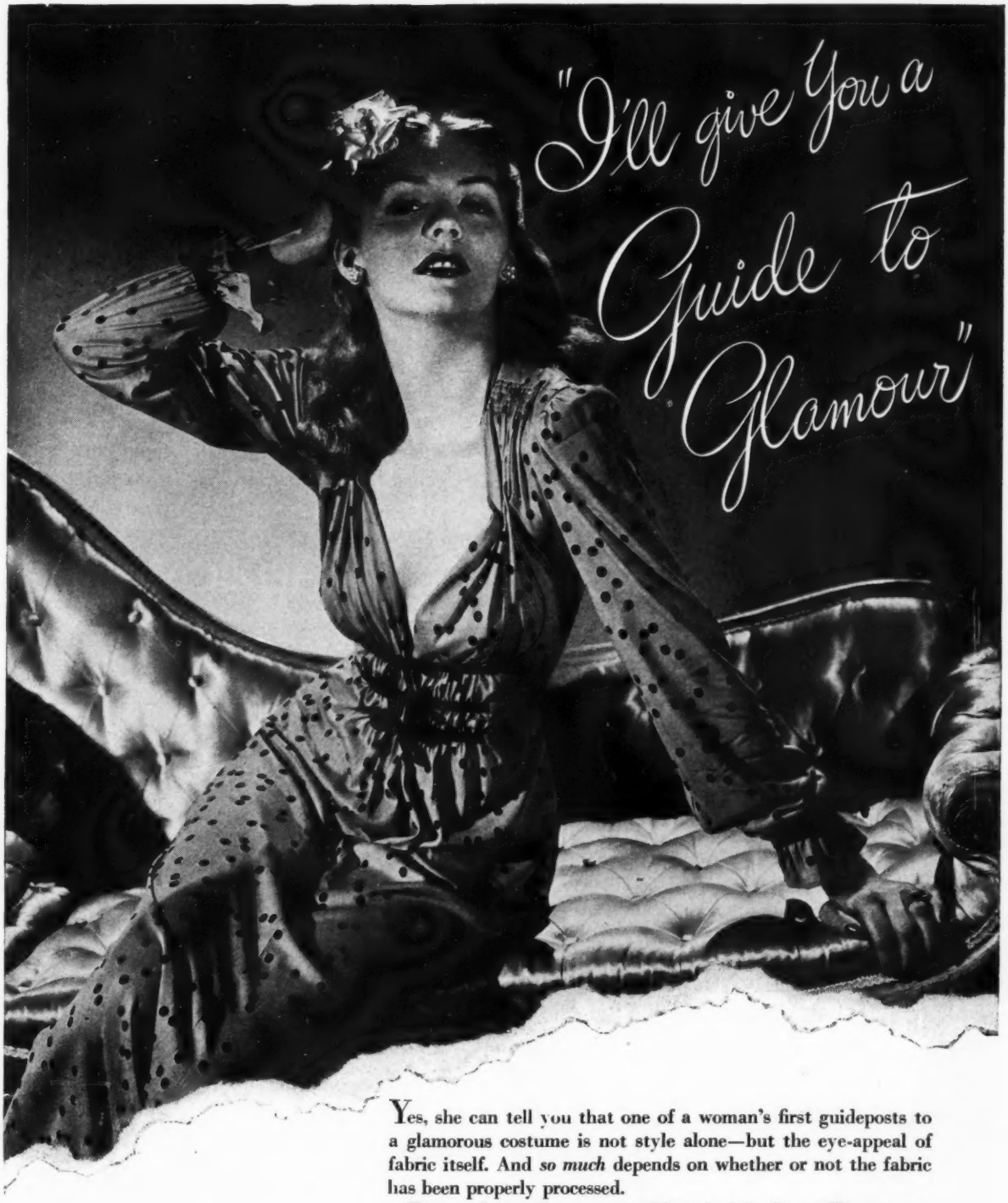

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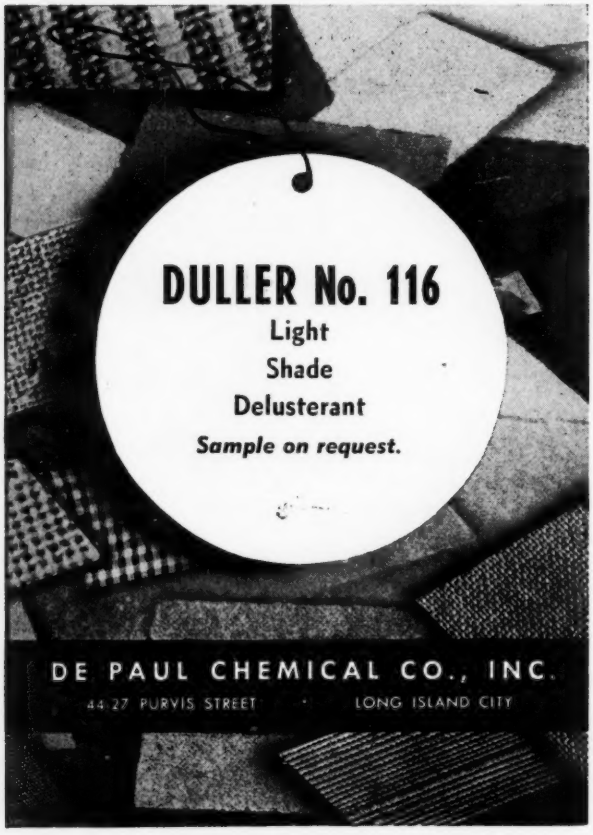

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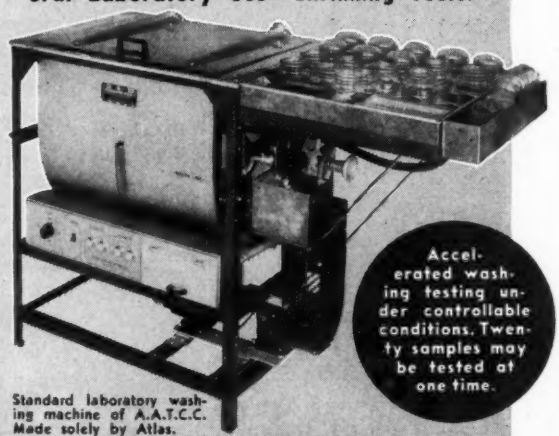

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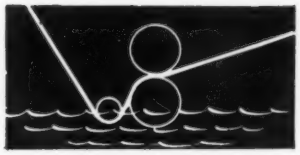

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THE Treasury Department and the banks of America are making it possible for farmers, doctors, and other self-employed people to participate in "automatic" Bond buying by special arrangement with their banks. This extension of the Savings Bonds program is not a partial payment plan and is intended *only* for people who are not in a position to take advantage of the Payroll Savings Plan.

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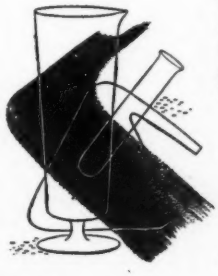

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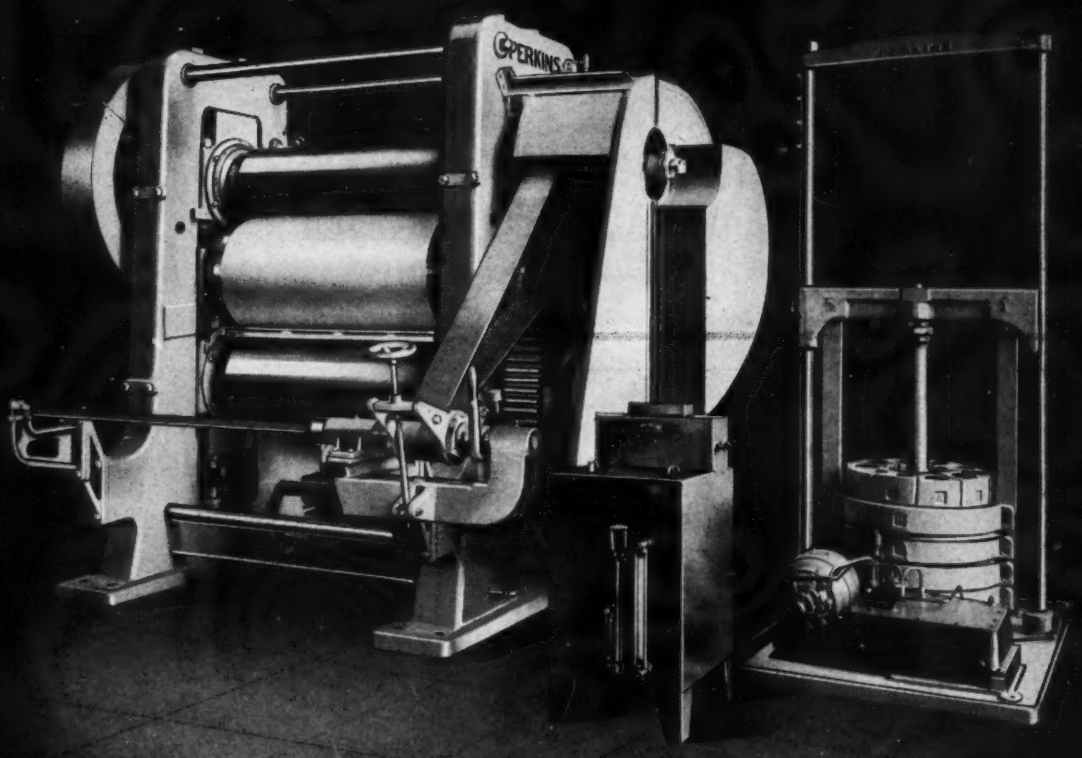

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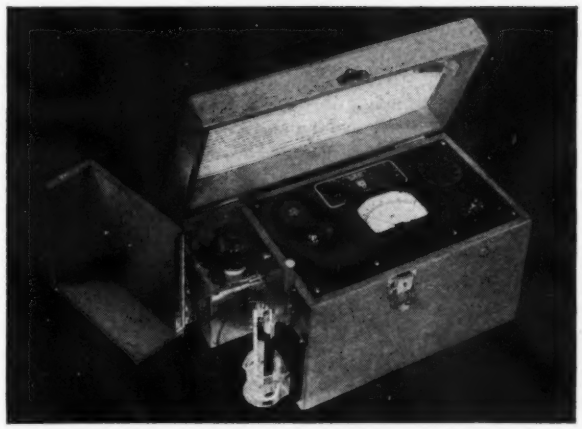

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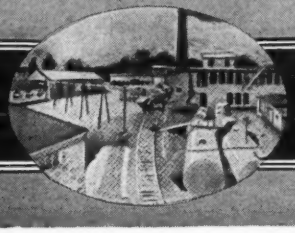

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7. *Penetration* into cloth of various coatings.
8. *Retention of fillers, starch and sizing* in cloth after laundering or cleaning.
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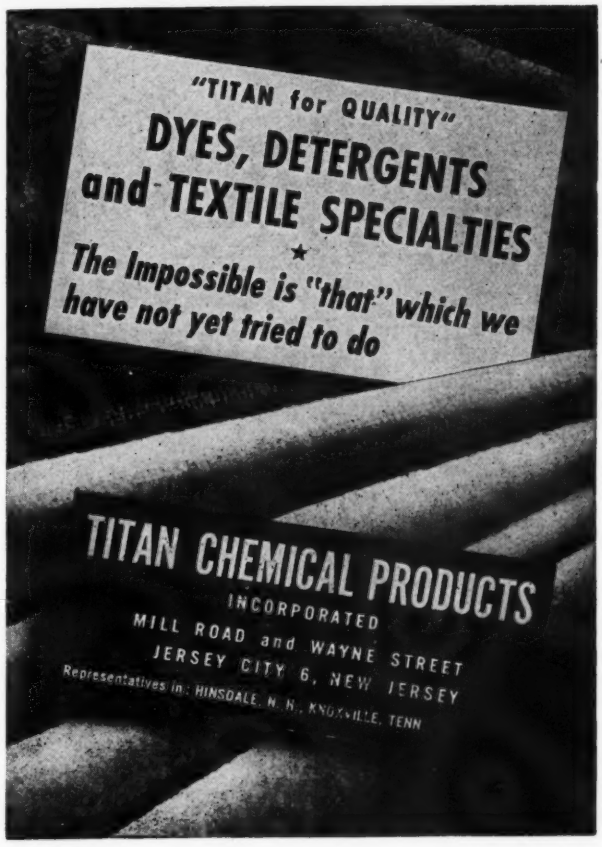
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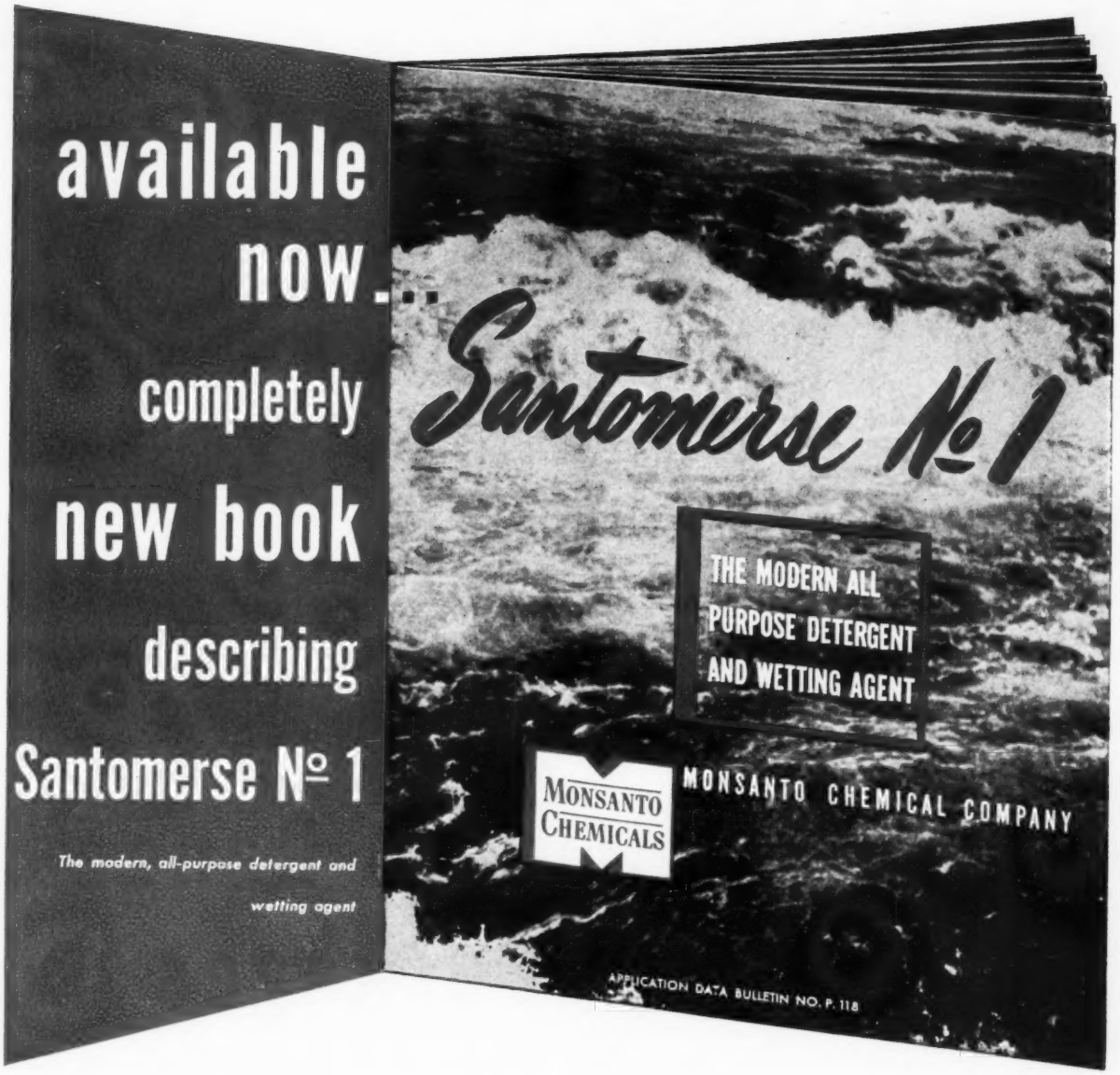

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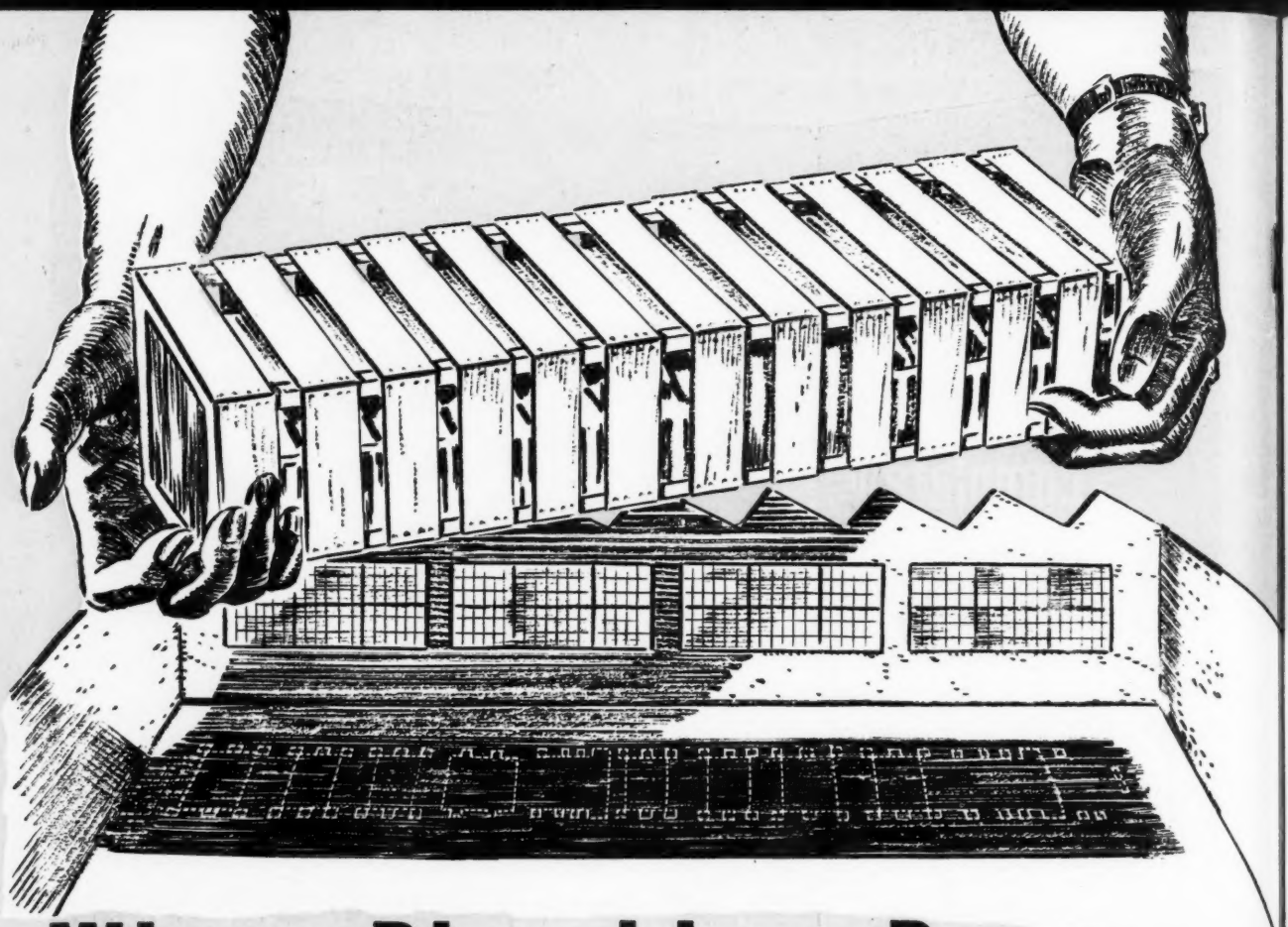

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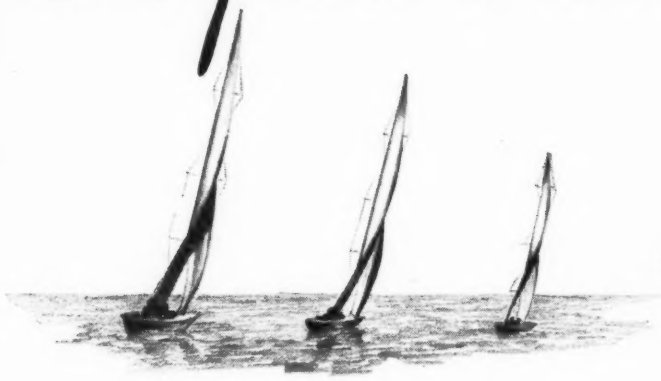

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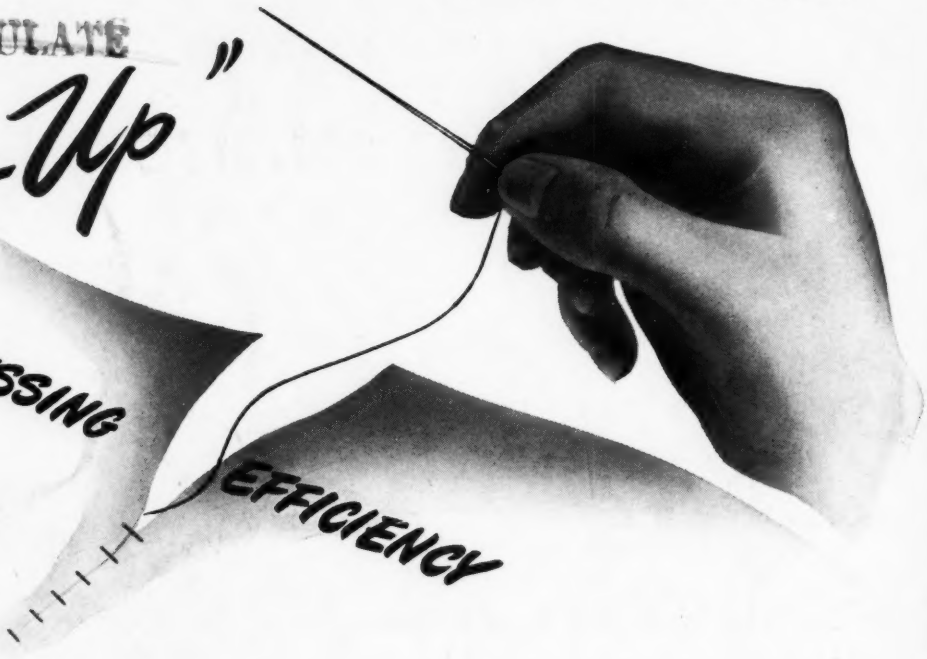

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